PARK SCIENCE

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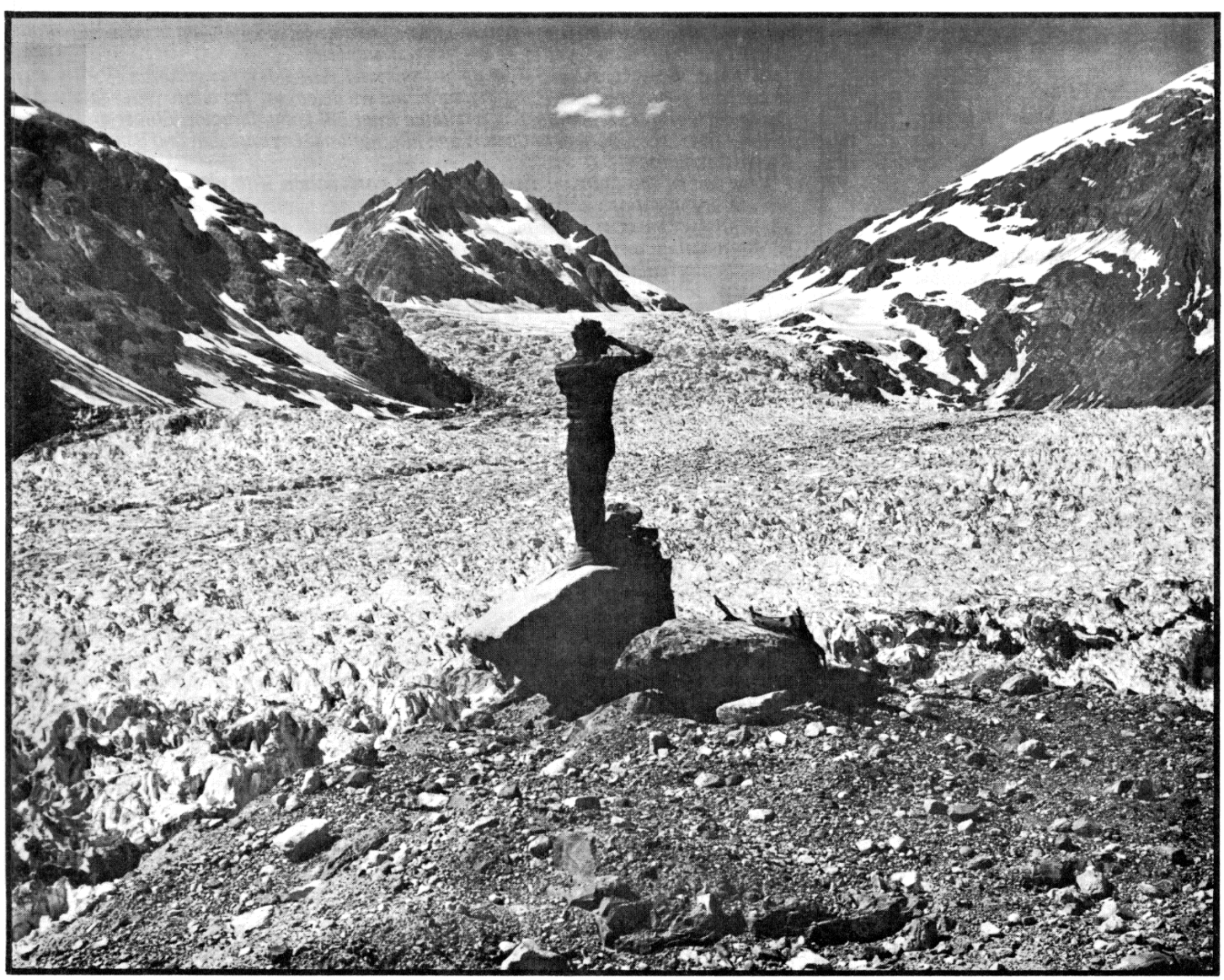

PARK SCIENCE FALL 1982 | A report to park managers of recent and on-going research in parks with emphasis on its implications for planning and management.

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Cover Photo: *Muir Glacier, one of the sites visited during a nine-day scientific study trip through Glacier Bay NP and sites along the Park's Gulf of Alaska coastline.*

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Editor's Note:

A whole new level of science and management is emerging in the preservation of genetic materials . . . the germplasm bank network that is forming up to meet such rising specters as monoculture disaster and species exhaustion, combining the efforts of Forest, Park, and Soil Conservation Services among others.

To feed and clothe and medicate a world of ever-increasing human density is putting unbearable strains on the few species that people have leaned so hard on since civilization began. The preservation of genetic material is "the cupboard" to which — if we don't allow it to go bare — we can go for such new properties as can be injected into old strains for added values, such as flavor, nutrition, and stamina, or simply to cut down on the labor involved in planting, tending, and harvesting. Improvements such as these can be accomplished through the collection, study, and use of new plant materials — research at its most basic.

How does all this involve the National Park System?

The dawning recognition, on a worldwide basis, of the need to catalogue, understand, and preserve the genetic materials that are in many cases slipping into extinction under pressures from human development, has brought into sharp focus what may well turn out to be one of the highest values of the National Park System — its preservation of untested plant and animal germplasm in its natural environment and the natural dynamics of the process of genetic evolution.

*Last November (1981), the U.S. Department of State and AID co-sponsered a U.S. Strategy Conference on the Preservation of Biological Diversity. (**Park Science**, Vol. 2, No. 1, p. 18). Under Secretary of State James Buckely addressed the conferences on the worsening condition of what he called "the safety net" of global genetic diversity — the accelerating impoverishment of that resource, and the danger it represents for all life on earth. He suggested that these are resources "we are still too ignorant to understand" and likened them to "books yet to be deciphered and read."*

At that conference, the call went up for improved germplasm repositories —better ways of collecting, holding, and using the materials we discover. The entire proceedings from the November 1981 conference is available from Bill Long, Director, Officer of Food and Natural Resources, Bureau of Oceans and International Environment and Science, Dept. of State, Washington, D.C. 20520.

Now comes the National Park Service in conjunction with other Federal, State and private organizations with a five-day international symposium and workshop on the application of genetics to the management of wild plants and animal populations. Purpose of the meeting was to provide guidance to the U.S. government on how to proceed domestically and through international channels to promote the maintenance of biological diversity.

In this issue (page 5) is a preliminary report on the August 1982 conference. In the previous issue (Vol. 2, No. 4, p.2) is an editorial about the World Biosphere Reserve conference at Kalispell, MT, in June 1982. The two approaches are destined to be tightly associated in any future where humanity is focusing on long-term survival.

Most of the scientific and management work we do today has its most profound meaning within the context of the whole earth. The proportions of our problems are irreversibly global and only a global context will do as a framework for our continuing efforts at research and management. The conferences of the kind that began in Stockholm in 1972 have been, in effect, writing the caption that goes with the blue marble picture of earth as seen from space.

But global problems almost never lend themselves to global solutions. Most of them are best solved by taking advantage of local situations and resources — marshaling them in ways that respect both the physical and the social environmental patterns of the locality. U.S. solutions do not apply to the countries of , say, Africa and Asia, and vice versa.

Pluralism and regionalism are interesting, powerful forces — a tremendous reservoir of creativity that matches, at the human social level, the genetic diversity we seek to preserve at the biological systems level. Within the enormous cultural range of responses to environmental issues there exist a myriad of undefined, untried capabilities for solving our various problems.

Man and the Biosphere's Project 14 —the establishment of a network of World Biosphere Reserves consisting of paired areas (natural and manipulated) that represent all the world's great biomes —is one of the promising moves toward an organized study, collection, and preservation of a retrievable inventory of genetic materials on a worldwide information basis.

So far as we know, we are the only speck of matter in the known universe that carries life. We human beings have risen to the awesome position of dominance that carries with it a Promethean choice: We can continue to destroy the precious germplasm that makes earth unique in all of Creation, or we can assume the role of Good Steward and unselfishly shepherd these tiny links with the future.

Genes have the longest life potential of anything alive. Essentially, the August conference asked: "Who among us short-lived beings has the right to eliminate any of this

What You See Is Sometimes What You Miss

By Keith A. Yarborough

Visitors to the national parks want air they can see through, not air they can see! They want to view the grand vistas without a curtain of unnatural haze obscuring their grandeur. This desire underlines one of the main goals of the National Park Service Air Quality Program — to secure undegraded natural visibility and to preserve it in the future.

Since the 1950's public concern has grown as the scenic beauty of many parks was dimmed by air pollution. Often this pollution is emitted at great distances — even hundreds of miles away from the parks. In the 1960's and 1970's the Grand Canyon sometimes was filled with haze and smoke, Yosemite Valley was subjected to smog, Arches was periodically engulfed in smoke, and Capitol Reef almost had a huge coal-fired power plant as its neighbor. Simultaneously, in the east, Great Smoky Mountains became more hazy, but not from the natural haze that gave the park its name. The same was occurring at Shenandoah, Acadia, and others.

In August 1977 the Congress responded by adopting the nation's first visibility protection requirements for national parks and national wilderness areas. In these amendments to the Clean Air Act, the Congress explicitly recognized clean air as a nationally important natural resource which is to be protected. This recognition extends the mandate of the 1916 Organic Act "to conserve the scenery and the natural and historic objects and the wildlife" in the national parks. Visitor enjoyment and health, the preservation of certain fragile cultural resources, and sustaining the integrity of natural resource systems are all dependent on good air quality in the parks.

Inherent in the preservation of the parks' grandeur is the protection of their scenery and inspiring vistas. This protection requires clean air and good visibility . . . the "seeing" of distant objects. Historically, Americans have placed high value on *good* visibility in the national parks. Judging visibility is a qualitative process — perceiving the characteristics of objects in a vista, their distance from the viewer, the quality of the atmosphere, and the illumination along the sight path. It also involves the nature of the human eye, and the brain's interpretation of the image at the eye.

Beginning in late 1977, the National Park Service developed a comprehensive Air Quality Program. This effort has included both the physical, quantitative measurement of visibility parameters in a number of parks throughout the system, and the qualitative assessment of its perception by visitors. The Southwest Region has been actively engaged in quantitative work since its inception. Because we needed a means to measure visibility so as to capture details of form, line, size, texture, and color differences when viewing distant objects, a dual purpose research and monitoring program was established.

1. Visibility measurements are made at 9 stations (Bandelier, Big Bend, Capulin Mountain, Carlsbad Caverns, Guadalupe Mountains, Chaco Culture, Navajo, White Sands, and Wupatki), as part of the Servicewide project VIEW (Visibility Investigative Experiment in the West) network of 28 stations. The network concept provides a cost-effective coverage, allowing the results from a few carefully selected sites to be applied to many parks within the network's extent. Each station is important because it supports the greater whole. Furthermore, the network supplies data for a large area, a vital function in view of the fluidity of atmosphere and the ease with which air masses move quickly over vast distances.

The multispectral contrast teleradiometer ("tele" or MCT for short), developed by Drs. Bill (Big Daddy) Malm and Ken O'Dell, was chosen for this work. The instrument measures the brightness (radiance) of a dark-colored target along a sight path, using four different visible light wave lengths (violet, blue, green, and red). It also gives a comparison ratio between the brightness of the target and the brightness of the sky behind the target. Four to six targets are sighted around each park's station. Readings are taken at 9 a.m., noon, and 3 p.m. daily throughout the year.

From this brightness ratio, the visual range (Vr), for each target can be calculated. Vr is a measure of the degree of visibility degradation caused by the "gunk" in the air between the target and the observer . . . material that scatters and attenuates light along the sight path. Thus, Vr *represents* the distance at which an object is just barely visible under any set of viewing conditions. The greater the Vr value, the better the visibility is. The measure tells the condition of the air at any time, and permits comparisons to be made among various observation stations in the network.

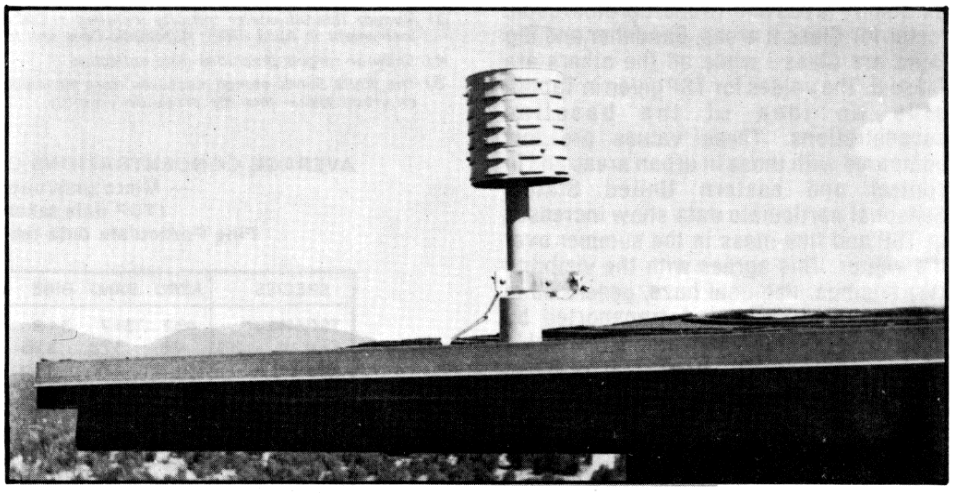
However, Vr should not be taken literally. The targets used in the west can only be seen at a maximum distance of about 200 kilometers (km) because of the earth's curvature. Yet the theoretical upper limit for the cleanest air is 391 km and the visual ranges reported from many Project VIEW stations often exceed 200 km.

2. Total and fine particulate measurements, with chemical analyses, are made in order to determine the nature of the material degrading the visibility at any given time. This material can be of natural origin: blowing dust or water vapor; it can also be produced by emissions from human sources: smelters, steel mills, coal-fired power plants, autos and residential heating in urban areas, etc. Analysis can establish the difference.

The particulate measurements are made at:

A) Nine total suspended particulate (TSP) stations (Aztec Ruins, Bandelier, Big Bend, Capulin Mountain, Guadalupe Mountains, Chaco Culture, Navajo, White Sands, and Wupatki) under a continuing contract with Dr. Jarvis Moyers of The Analytical Center at the University of Arizona in Tucson.

B) Five fine particulate stations (Chaco Culture, Fort Union, Gila Cliffs, Grand Quivira, and Carlsbad Caverns) as part of EPA's Western Fine Particulate network of 40 stations; with analyses done by the Air Quality Physics Group of the University of California at Davis.



Stacked Filter Unit *for measuring coarse and fine particulate concentrations at Bandelier National Monument.*

Fine particulates (size range from 0.1 to 2.5 microns) are especially important for determining the visibility at a station. These scatter the greatest proportion of light and degrade visibility the most. This effect is especially noticeable in very clean air such as still exists in the Southwestern U.S. For example, if the Vr is 120 miles and a tiny amount of sulfate aerosol is added, the Vr can be reduced to 80 miles. However, for dirty air, the effect is much less noticeable. If the Vr initially is 15 miles, a tiny incremental addition of sulfate aerosol will decrease the visibility to 14.1 miles.

The data from the VIEW network are reported seasonally. Table 1 summarizes the geometric mean values of visual range at the Southwest Region stations. In general, visibility is better in the winter and spring and more degraded in the summer and fall. However, these western visual ranges are very much better than those found in the eastern United States. The best visibility throughout the entire VIEW network has been found consistently at Chaco Culture in northwestern New Mexico. Its overall arithmetic mean Vr for all seasons is 203.5 km with Navajo in northeastern Arizona as a close second. The Four Corners area of Colorado, Utah, Arizona and New Mexico has the best visibility remaining in the contiguous 48 states. No long-term trends are noticeable as yet.

Particulate data are summarized in table 2. These show the TSP and fine mass loadings and selected species. They characterize both natural (Al and Ca from soils/dust) and human-caused emission sources (Carbon, SO^4, and NO^3, and Pb). Aztec Ruins is located close to the 2250 megawatt Four Corners Power Plant. Hence, its high TSP, carbon and lead concentration levels. Capulin Mountain, Chaco Culture, and Navajo show cleaner air, while Bandelier and Big Bend are less clean. The Amended Clean Air Act permits *incremental increases* in the annual TSP geometric mean above the area's baseline of 5 micrograms/cubic meter for Class 1 air quality areas and 19 micrograms/cubic meter for Class II areas. Bandelier and Big Bend are Class I while all the others are Class II. The values for TSP given in Table 2 give an idea of the baseline concentrations. These values are low compared with those in urban areas and in central and eastern United States. Seasonal particulate data show increases in TSP and fine mass in the summer over the winter. This agrees with the visibility (Vr) findings. Regional haze, generated in southern California and transported by cyclonic air masses, causes considerable visibility degradation in west Texas and in the Four Corners Area. Local smelter and power plant emissions add to this impact.

Support for this work has been supplied by the WASO Air Quality Division since 1978. Especially effective have been the efforts of the team of technical experts of that Division located in Denver (AIR).

Most important, is the work of field managers and personnel at each of the park stations. They continue to make the daily measurements in all kinds of weather, while performing their many other duties in the parks. They grapple with the vagaries of equipment, operating instructions, budget shortages, Regional and WASO people — with perseverance and good humor. They are the *sine qua non* — the real NPS Air Quality Program.

Keith Yarborough is a physical scientist with the Division of Nature Resources, Southwest Region, NPS, and serves as Air Quality Coordinator.

Telephotometer, *affectionately referred to at Bandelier NM as "our artillery for fighting air pollution," is read by Christi Daugherty, Student Conservation Association worker at the Monument.*

TABLE 1
SEASONAL VISUAL RANGE (Vr) for SWR STATIONS
— (Geometric Means) km.

	STATION								
SEASON	BAND	BIBE	CAMO	CACA	CHCU	GUMO	NAVA	WHSA	WUPA
Summer 1978	172	148	NI	157	187	NI	192	118	166
Fall 1978	155	130	NI	179	203	NI	191	125	122
Winter 78/79	226	212	NI	245	[4] No Data	NI	[4] No Data	190	188
Spring 1979	284	163	NI	151	188	NI	160	143	201
Summer 1979	148	154	NI	139	198	NI	164	114	159
Fall 1979	149	146	NI	142	198	NI	175	115	162
Winter 79/80	186	174	NI	206	298	NI	264	159	215
Spring 1980	174	168	137	197	176	NI	145	132	141
Summer 1980	164	138	139	3)	180	NI	168	119	158
Fall 1980	176	146	207	3)	213	NI	230	139	180
Winter 80/81	221	208	273	3)	257	NI	256	177	166
Spring 1981	187	183	180	3)	177	NI	192	141	170
Summer 1981	147	139	160	3)	163	NI	152	112	141
Fall 1981	176	143	201	3)	208	NI	218	133	176
Arithmetic Mean	183.2	160.9	185.3	[5] 177.0	203.5	—	192.8	[5] 136.9	167.5

REMARKS:

1) NI = No Instrument

2) Automatic Teleradiometer installed at GUMO in February 1982.

3) Manual Teleradiometer initially installed at CACA changed to Automatic instrument in April 1980. Automatic Data still to be analyzed.

4) Snow on targets precludes data collection.

5) The White Sands station measures more the impact of nearby Alamogordo, NM - an urban area — than the areawide visibility.

6) Legend

AZRU = Aztec Ruins
BAND = Bandelier National Monument
BIBE = Big Bend National Park
CAMO = Capulin National Monument
CACA = Carlsbad Caverns National Park
CHCU = Chaco Culture National Historical Park
NAVA = Navajo National Monument
WHSA = White Sands National Monument
WUPA = Wupatki National Monument

TABLE 2
AVERAGE CONCENTRATIONS OF PARTICULATE SPECIES AT SWR STATIONS
— Micro gms/cubic meterofair (geometric means)
(TSP data taken from May 1980 to May 1981)
Fine Particulate data taken from August 1979 to October, 1980)

	STATION									
SPECIES	AZRU	BAND	BIBE	CAMO	CHCU	NAVA	FOUN	BICL	GRQU	CACA
TSP/Mass	43.7	31.7	34.8	26.2	25.5	25.1	—	—	—	—
Carbon	4.6	3.78	3.93	3.3	2.12	2.77	—	—	—	—
$SO_4^=$	1.37	2.2	3.63	1.43	1.35	1.41	—	—	—	—
NO_3^-	0.53	0.47	0.72	0.60	0.32	0.31	—	—	—	—
Al^{+++}	1.92	0.77	1.09	0.75	0.83	0.93	—	—	—	—
Ca^{++}	0.72	0.41	1.35	0.46	0.34	0.62	—	—	—	—
Pb	0.45	0.12	0.09	0.06	0.08	0.08	—	—	—	—
Fine Part. Mass	—	—	—	—	4.50	—	3.90	4.22	4.42	5.67
$S/SO_4^=$	—	—	—	—	0.39	—	0.32	0.45	0.39	0.48
Soils	—	—	—	—	1.26	—	0.95	0.87	0.92	1.46

Genetics Conference Draws 300 Attendance

More than 300 field scientists and resource managers from Federal, State, and private sectors met for five days in Washington, D.C., August 9 - 13 to listen to two dozen of the world's leading geneticists and to consider the state of the art in managing natural populations, including the newest developments from the fields of evolution and genetics.

The international symposium and workshop was billed as "The Application of Genetics to the Management of Wild Plant and Animal Populations," and the actual proceedings hewed closely to the five workshop aims:

- to review the scope, magnitude, and sources of worldwide plant and animal species losses;

- to assess the economic, social, ecological, political, and strategic implications to the U.S and other countries of a continuing decline in species diversity, particularly as it may relate to world food supply, energy demand, and industrial output;

- to identify and evaluate technologies, institutions, and scientific knowledge available for conserving biological diversity;

- to review the nature and effectiveness of U.S. government domestic and international policies and programs, and

- to recommend initiatives the U.S. should undertake to stimulate and assist an expanded worldwide effort in this area.

Each morning session consisted of five lectures by such authorities as Sir Otto Frankel, Paul R. Erhlich, and Michael E. Soule; the afternoon sessions were given over to workshops on specific problems. The bringing together of people from a variety of communities — zoos, small state parks, huge National Parks — had much the same effect as a series of overlays, showing up the similarity of problems faced by all. If we choose to interfere in natural genetic events, what measures are available to us ? How can we find out more about the long-term effects of implementing these measures? For instance, what happens when historically isolated populations are mixed ?

The week-long discussions pointed steadily to one conclusion: that the health or collapse of ecosystems frequently depends on management's ability (or failure) to forsee the vulnerability of populations and how various populations interact in the long time-frame.

General topics for the five days were (1) isolation of populations, (2) extinction of populations, (3) founding populations, (4) merging of naturally diverging populations, and (5) preserving the natural integrity of populations.

Christine Schonewald-Cox, who organized and ran the conference, is presently compiling and editing a volume to be published by Addison-Wesley of Reading, MA 01867, scheduled for publication in May 1983 for about $25 a volume. In addition to a compilation of the conference papers, with editorial inserts, the book will contain a complete glossary of terms, a set of exercises in genetics, and an extensive literature list.

Schoenewald-Cox observed that most of the park areas now in existence are relatively small, static ecosystem scraps, containing what are, in effect, enlarged captive populations. She suggested that what is most needed by managers is an understanding of their role in dealing with the problems of managing genetic material in small areas. "The reasons for this are two," she said. "First, the aesthetic (and possibly the moral) obligation to keep as many species as possible from disappearing. Second, the possibility that in some future time we might again be able to re-establish sustaining populations of the species we have kept alive."

The book that is growing out of this conference in envisioned by Shonewald-Cox as "a reference/text, primarily for those interested in managing natural populations."

A mailing list of all those who attended is available from Schoenewald-Cox at the Natural Sciences Division, National park Service, Department of the Interior, Washington, D.C. 20240.

From the Everglades One Scientist's View

By James A. Kushlan
Research Biologist, Everglades, NP

One should feel fortunate if the benefits of attending meetings match, over the long run, the time and energy expended in attending them. The Symposium on Application of Genetics to the Management of Wild Plant and Animal Populations will balance many more of the more usual sorts of meetings. Arriving with no special expectations, a nearly open mind, and an active interest in the topic (a matter of concern for a park faced with a small and in many cases rapidly decreasing animal populations), I found myself a few days later with many expectations, a well exercised mind crammed with ideas and information, and an increased concern for the genetic consequences of resources management.

I judge the symposium to have been an outstanding success. It was, first of all, exquisitely organized. Facilities, readily available background material (actually homework), selection of topics, progression of ideas, and choice of participants left little to be desired. Clear goals and crisp execution allowed the real work to move unrelentingly forward without distraction. That work was to have been the transfer of information and techniques from scientific practitioners to conservation—oriented biologists and managers. This the symposium accomplished, but not, perhaps, in ways some might have expected. Few simple recipes for management action were provided, but the ingredients were identified and mixed well. Early in the conference, which provided ample opportunity for discussion, the scarcity of answers was viewed with disappointment. Few thought so by the end, when everyone had been taught what questions to ask.

Simple solutions do not exist for management of wild populations. Ecology and genetics under the best of circumstances can provide their theories and their new ways of approaching old problems. This conference supplied both, and any manager willing to concern himself seriously with resource problems could not help but benefit from the new ways of thinking offered by the speakers, workshop leaders, and participants. Such a manager would now realize that preservation of genetic resources is as

fundamental a concern as preservation of species diversity, population size, demography, community structure, and ecosystem processes. Ignoring any of these concerns will lead to the loss of resources.

That approaches and insight were offered rather than recipes is not surprising in retrospect. Population genetics, especially at the molecular level, is one of the most rapidly developing, changing, and diversifying fields of biology. All but a few population geneticists, supported solely and poorly by funding for pure research, have had little opportunity to think about the practical application of their work to wild populations. The guidance of the pioneers of conservation genetics was much in evidence at the conference, which should be viewed as a beginning, not the end, of the difficult task of transferring ideas and techniques across disciplines. The beginnings were mutualistic, most of the genecists benefitted as much as did the field people. The geneticists had their interests broadened, their fruit-fly oriented ideas debated, and their contributions appreciated. Some of the most distinguished of evolutionary geneticists will be devoting much more effort to real-life problems in the years ahead, and that may be the most lasting accomplishment of this landmark symposium.

We should not, though, let the excitement of discovery cause us to swallow new approaches in their entirety. In the recent past, uncritical acceptance of the management applicability of concepts such as island biogeographic theory and the once axiomatic correlation between species diversity and community stability has become somewhat embarrasing when more thorough debate revealed fundamental weaknesses and ambiguities.

Likewise, application of molecular genetics, to ecosystem management stands in need of thorough and prolonged debate. By the conference's end nearly all participants had converted to the belief that conservation of genetic diversity was a worthwhile goal under nearly all circumstances.

But an ecosystem manager might need to search a bit further for guidelines. The logic of maximizing the genetic diversity of captive tigers does not necessarily hold for all wild populations. In some parks where natural selection has been highly directional, might not genetic diversity be naturally low in populations specifically adapted to their local environment? We have, for example, found that Everglades alligators have very low levels of electrophoretic variability but are genetically distinctive from other populations. Should it not be the purpose of a national park to preserve the genetic distinctiveness of the local populations irrespective of how genetically diverse they might be or what portion of their species genes they might retain? That we may have more thinking to do should not detract from what has been accomplished. The symposium forcefully opened the way to exploring such problems, and that is as much or more than anyone should have hoped for.

And From Hawaii Another Observation

By Charles P. Stone
Research Scientist, Hawaii Volanoes NP

The Genetics/Management Conference was one of the top three meetings I have ever attended. I especially enjoyed the interaction among the geneticists. The workshop served to bring me up to speed and made me feel more confident about recommending things to management. Several others expressed the same feeling.

I had long conversations with two managers who also felt it was excellent. Their main criticism the last night, was that there should have been more biologists other than geneticists. I was surprised too that more State Forest Service and Fish and Wildlife biologists didn't show up, but unless distribution of the brochures was badly skewed that is not the fault of the organizers.

My one criticism is that not nearly enough was said about preserve size and design with respect to genetics, island biogeography theory, etc. I guess maybe Craig Shaffer will have a workshop to handle that; but it can come none too soon. I really think we're wasting time and effort on tracts that are unmanageable for the long term. Preserve strategy, to me, is one of the most important applications of genetics to management.

I would encourage more efforts of this kind. Please keep them in a workshop format so people can attend. Whoever decided to do that for NPS people should find out how to do it for other agencies and organizations so more of them can attend.

Congratulations to Dr. Briceland, Chris Schonewald-Cox and the others involved for conceiving and hosting this landmark Conference-Workshop.

If It's Loose and Dry SIR Can See Thru It

The Sahara Desert unmasked! This is the possibility raised by a strip of film bearing picture-like data from SIR-A, a synthetic-aperture imaging radar system that had been carried over the region on the space shuttle's second test flight in November, 1981.

Science News (A Science Service Publication), for June 26, 1982, describes the excitement felt by U.S. Geological Survey's Carol Breed when she rolled the film out on her light table: "My God, where is the sand sheet?" The image revealed a vast network of channels, "their dendritic patterning reminiscent of riverbeds and tributaries, from little ditches just at the radar's limit of resolution to huge swaths as wide as the Nile Valley." Maurice Grolier, one of Breed's colleagues, had been to the area barely a month before. He had driven over the terrain and testified that there was no trace of what the imagery showed. "Just thousands upon thousands of square kilometers of sand, sand, sand, in places piled tens of meters thick."

In effect, the radar acted as an x-ray eye. Instead of reflecting the radar beam, as a solid surface or a layer of water will do, the low-density surface of loosely packed sand allowed most of the beam's energy to pass right through and be reflected by whatever lay beneath. Modifications of the method will be tried on another shuttle flight in the summer of 1984 on SIR-B, being developed at Jet Propulsion Laboratory in Pasadena, CA, under direction of Charles Elachi.

Most of the geological work on the Saharan core that was unveiled is being done at the USGS Branch of Astrogeologic Studies in Flagstaff, AZ. The desert studies group is headed by Jack McCauley.

Glacier Bay Staff Honors Two For Venerable Research Record

By Gary Vequist

Two scientists with a combined total of 97 years spent in research were honored at a June 19 dinner arranged by the Glacier Bay National Park and Preserve staff. Staff members and other scientists spent a rewarding evening discussing their long-term research efforts and the history of scientific discoveries made at Glacier Bay with Dr. Donald Lawrence, a plant ecologist from the University of Minnesota, and Dr. William Field, glacial geologist with the American Geographical Society.

Dr. Lawrence and Dr. Field returned to Glacier Bay to re-examine their research sites and to familiarize accompanying scientists with their studies.

The research team boarded the NPS vessel "Nunatak" on June 17th for a 4-day trip to study sites throughout Glacier Bay followed by a 5-day trip to sites along the Park's Gulf of Alaska shore, primarily in Lituya Bay.

William Field made his first visit to Glacier Bay in 1926 and initiated a long-term project to record glacier variations by means of precise ground measurement and photography of glacier termini, done at several year intervals. On this trip, Field was able to make observations of most major tidewater glaciers. Monitoring efforts will be undertaken by park rangers in 1982 to maintain the data base on movement of glacier fronts. Dr. Field is attempting to locate other scientists to resume and expand glacier monitoring from specific observation stations.

Nowhere in Alaska has there occurred within recent years so rapid a disappearance of glacial ice. Glacier Bay is an ideal location for more sophisticated scientific techniques to develop a better understanding of the relationship between glacier regime and the climatic environment. The measurement of ice mechanics, mass balance and meteorological variations, when evaluated with long term data records, could provide valuable knowledge of the relationships behind the creation of this spectacular landscape.

Dr. Lawrence evaluated changes at eight permanent research plots in Glacier Bay. His plant studies, begun in 1941, continue the research begun in 1916 by Professor William S. Cooper. These permanent plots are the longest record of vegetative development on terrain of known age following glacier recession.

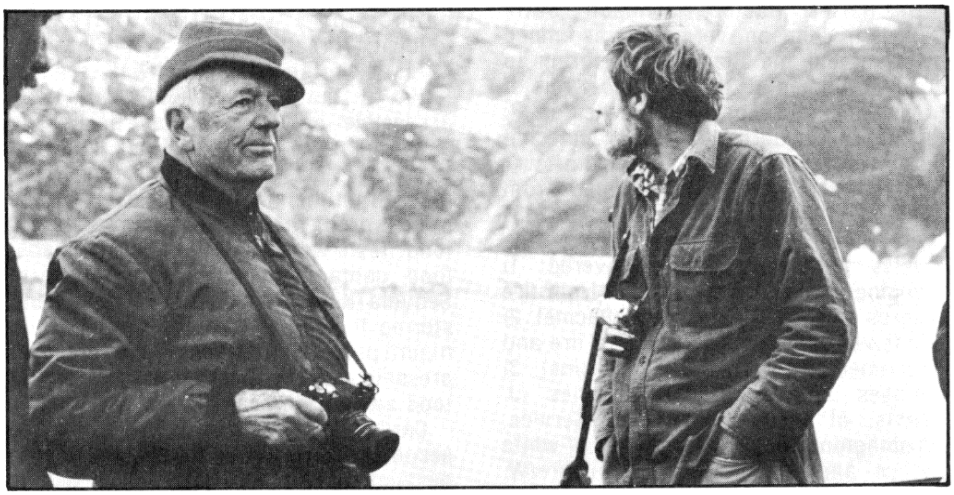
The rapidity of vegetation change following glacier recession has made it possible to map and photograph the course of plant succession. These studies have provided important contributions to the development of plant succession theory.

Other researchers participated on this trip to investigate various aspects of the glacier recession on patterns and processes of physiographic ecology. Dr. Peter Wardle, an authority of arctic and alpine timberlines, from the New Zealand Department of Scientific and Industrial Research, examined the remnant forests above 2,400 feet that were left uncovered by glacier ice 200 years ago. Dr. Mark Noble of the Arctic Alpine Research Institute of Colorado, and Dr. Ian Worley of the University of Vermont participated to obtain experience needed to continue monitoring of the plant succession study.

The accurately documented glacial recession creates a unique opportunity for the study of glacier geology and plant ecology.

Gary Vequist is a resource management specialist at Glacier Bay NP. The photos of Dr. Field and Dr. Lawrence were taken by Dr. Mark Noble, research associate at the Institute of Arctic and Alpine Research, University of Colorado.

Dr. Donald B. Lawrence *surveys one of the permanent plots that were remapped during the recent research trip in Glacier Bay NP. This was Dr. Lawrence's 11th trip to the Park.*



Dr. William O. Field *is shown here on June 18, 1982, aboard the NPS vessel M/V Nunatak in Johns Hopkins Inlet, Glacier Bay NP. Gary Vequist's profile can be seen to the left of Dr. Lawrence. Looking out over Glacier Bay is Dr. Ian A. Worley, professor of botany at the University of Vermont.*

Rainier Disturbances Described

A recent history of catastrophic disturbances is described in "Fire and Other Disturbances of the Forests in Mount Rainier National Park," by Miles A. Hemstrom and Jerry F. Franklin in *Quaternary Research* 18, 32-51 (1982). Hemstom is area ecologist at the Willamette National Forest, Eugene, OR 97440, and Franklin is chief plant ecologist of the Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Corvallis, OR 97331. Fires were found to be by far the most important major disturbers, followed by snow avalanches and lahars (volcanic mudflows). The largest fire episode, in 1230, affected approximately 47 percent of the forests in what is now Rainier NP. Most of the forests are over 350 years old, and several stands are more than 1,000 years old. Natural fire rotation was estimated at about 434 years.

Spotlight on a Region
Science And Resources Management Activities In Alaska

Fire Ecology/FIRE-PRO

During the 1982 field season, a pilot study was initiated that will contribute to a comprehensive fire management plan for Denali National Park and Preserve. Joint fire ecology research and FIRE-PRO monitoring efforts were concentrated in that portion of the park and preserve located north of the Alaska Range. The helicopter supported operation was based at Wonder Lake.

Vegetation and fuel loads were sampled in plots on a variety of burned sites and fuel types to obtain information about past occurrences of fire, fire effects on vegetation, plant succession and fuel loads. FIRE-PRO and research teams established before and after burn plots and monitored fire behavior on two lightning-caused fires that burned nearly 3,000 hours before rain extinguished them. Alaska Regional Research Ecologist Gary Ahlstrand and Denali Resources Management Specialist John Dalle-Molle directed the integrated research and resources monitoring study.

MAB Fire Ecology Project

Dr.Charles Racine, Johnson State College in Johnson, Vermont, was funded by Man and the Biosphere Program to conduct studies on the ecological role of fire in the tundra ecosystems of the Noatak River Preserve during 1981-82. Racine and his crews focused their studies in the lower Noatak about 140 km upriver from Kotzebue in an area where 1977 and 1981 fires were available for studies. The studies and investigators covered: 1) mapping of fires in the Noatak from fire records and LANDSAT photos (Racine), 2) intensive study plots in the 1977 fire and experimentally burned sites (Racine), 3) biomass and productivity studies (J. Dennis, of the National Park Service, Washington Office), 4) responses of white spruce and mountain alder to fire(W. Patterson, University of Massachusetts), and 5) vegetal implications of past fires from pollen cores in tundra ponds (W. Patterson).

Fisheries Studies in Denali National Park

The second summer of fisheries investigations in Denali NP have focused on the Kantishna Hills area in parklands that were added in the 1980 Alaska Lands Act. This area is heavily mineralized, has been extensively mined in the past, and placer mining is continuing. Studies focused on determining distribution and abundance of Arctic grayling,habitat loss documentation, fish collections, stream gauging, temperature, turbidity and heavy metal sampling. Recently mined tributaries offered little fish habitat, apparently because of numerous alterations such as stream channelization, loss of bank coves and pools, artificial barriers, acute periodic high turbidities, potentially toxic mine drainage from riparian landfills, and reduced aquatic invertebrate populations. Streams heavily mined many years ago, however, such as Caribou Creek, still offer fair to good aquatic habitat in unmined stream reaches. Denali fisheries studies were conducted by Alaska Regional Fishery Biologist Ross Kavanagh and Denali Fishery Biologist Scott Meyer. Heavy metals sampling and analysis of water and fish tissues were accomplished through a reimbursement agreement with the U.S. Fish and Wildlife Service.

Wildlife Research in Denali

Grizzly bear-human interactions tops the list of wildlife priorities in Denali NP. Substantial numbers of incidents in the park began occurring only about 1977. The date coincides with both total and backcountry visitation increases following greater access to the park in 1971 when the Parks Highway opened. Prior to that date, Denali Park was accessible only by railway or by the circuitous and unpaved Denali Highway. Work in 1982 directed by Kathy Jope, focused on the greatest perceived source of bear problems — inadequate storage of food. Tests were made with backpackable food containers (also being tested in Sequoia/Kings Canyon and Yosemite) and storing food in waterproof containers in tundra ponds. The treeless tundra of Denali presents almost no possibilities for hanging food away from bears.

Caribou calving was observed for the second year in relation to potential mining development on the Cantwell or Dunkle Hills calving grounds. Also, monitoring of road-wildlife relations was conducted along the Denali Park road. In particular, visitor attitudes to the shuttle bus were compared to attitudes sampled in 1972, and numbers of wildlife seen and reactions were compared to similar data collected by Dr. Fred Dean and Diane Tracy, University of Alaska, in 1974. Close attention was paid to comparisons in wildlife response between shuttlebus and private vehicular traffic.

Wildlife Surveys

Inventory work in 1982 included a raptor survey along a portion of the Noatak River and Dall sheep count in portions of Gates of the Arctic NP. Wildlife studies are directed by Francis Singer.

Humpback Whales in Glacier Bay

In FY 1981 the NPS funded three humpback whale research contracts in Glacier Bay. The studies focused on (1) whale feed, (2) acoustics, and (3) whale behavior in relation to vessel traffic. A consortium of cruiseship companies donated additional money and a research vessel to assist in the feed study. A second and final summer of similar humpback whale research activities is underway with the National Marine Fisheries Service providing on-the-ground contract administration as in 1981. Preliminary results are due by winter 1982/1983.

A contract with the University of Alaska CPSU to conduct an expanded statistical analysis of whale behavior (primarily stressed and unstressed breath logs)will be completed in December, 1982. During winter/spring 1983 another Section 7 Endangered Species Act Consultation with the National Marine Fisheries Service is anticipated and possibly another humpback whale conference, sponsored by the Marine Mammal Commission. The results of all research activities should receive a full review at this time and may determine the extent and direction of continued restrictions (if any) on vessel traffic in Glacier Bay NP.

Future Directions of the Alaska Science Program

Regional Chief Scientist, Al Lovaas, concluded that the main resource problems facing Alaska in the future include bear-human interactions at Denali and Katmai, pressures to alter the road system in Denali, fire prediction and behavior information, mining activities, present and possible aquaculture projects, and potential stresses on both fish and wildlife populations from subsistence harvests in parks or from both subsistence and sport hunting in preserves. Many populations still are undetermined as to size or distribution. Productivity and allowable harvest of many Alaska populations, especially those in northern areas, is being understood for the first time. All the biological implications of the management goal in Preserves ("healthy populations") and in Parks ("natural and healthy populations") need to be explored. The State Subsistence Act and subsistence on National Parklands continue to be controversial subjects at the State level and will no doubt require attention.

Sometimes Science Can Only Give Reasons Instead of Solutions

Editor's Note: There are some areas where nature calls the shots. All we can do about it is try to understand, and then get the message out so that others too will understand. The role of science in this case is to find out what is happening, and then to spread the word. The idea that science is the key to control — of everything — is erroneous and can lead to the frustration described in the following article

by Jim Gladson

Oregon Department of Fish and Wildlife

While I was attending a service club luncheon recently, a gentleman asked me a very good question. In a frustrated tone of voice he said, "The ocean salmon season was a mess this year. Now we hear that upland bird populations are way down and that duck and geese numbers will also be low this fall. What has gone wrong and why don't you correct it?"

As I paused a moment to collect my thoughts before responding, I wished to myself that I could give him a snappy, two-minute answer that would send him away with a smile on his face. But that was not possible. The subject was too complex and time to explain was too short.

Even a 20-minute answer would not have completely erased his concern, but I gave it my best shot anyway. I don't think either of us was satisfied when I finished.

What he essentially wanted to know was why can't fish and wildlife populations be consistently high all the time. He seemed to feel that somehow the Department of Fish and Wildlife should be able to correct the ups and downs.

To me his question implied a belief that the Department had some sort of master control. Failure to use this power was somehow a result of incompetence, laziness or outright ill-intent. He had placed his trust and had been let down.

I will give one more try, here, at answering his questions. What has gone wrong and why don't we correct it?

Fish and wildlife managers do not have their hands on any master control. What these managers do have is a set of tools that allows them to work on the machine. Every day scientists learn more about how the machine works. They can even identify some malfunctions and fix them, or at least anticipate them and reduce the impacts on wildlife.

But when the machine that is nature decides to produce cold winters or wet springs, biologists often must stand back then try to pick up the pieces later.

That is essentially what has happened to upland bird and water fowl populations this past winter and spring. In Oregon, spring populations of some adult upland birds were high but a wet spring caused widespread nesting failures. Hunting seasons had to be cut back or not enough birds would go into this winter to rebuild their numbers.

The big waterfowl populations nest in Canada and Alaska. The story was the same there. Widespread nesting failures reduced the number of birds expected to come south this fall and winter.

Weather is not the whole story on the decline of coho salmon returns in recent years, but climate, winds, and related ocean conditions have been identified as possible contributors to the problem.

Fish habitat in the ocean can change just as bird habitats do on land. We can see snow or ice. We cannot see as easily what goes on beneath the waves.

In some years, poor ocean conditions may have a direct influence on the survival of young coho salmon first entering the ocean.

Specifically, the presence or absence of an ocean condition called upwelling may play a large role in whether those young coho smolts live or die.

Upwelling, which is brought on by a combination of northwest winds and certain weather patterns, pushes cool, nutrient-rich waters from the bottom toward the surface.

The rich waters allow the smolts to feed and grow more rapidly while also tending to reduce the killing of the small fish by predators.

A study going back several years has compared the occurrence of spring upwelling with coho salmon smolt survival and adult returns. The study shows a very close relationship between good upwelling years and higher returns of coho adults the next season. Similar relationships do not appear for chinook salmon or steelhead.

Because coho declines in the last five years have been accompanied by poor ocean upwelling, biologists are becoming more convinced that these ocean conditions are a major factor affecting coho survival.

Like the snows in Eastern Oregon, ocean currents are beyond anyone's control. But rather than serving as a convenient excuse, dealing with environmental disturbances becomes one of the major challenges in fish and wildlife management.

Habitat is the key for survival of any fish or wildlife species. Without a place to live, feed, rest and reproduce, no animal can survive. For upland birds this means developing and protecting watering sites in the desert, maintenance of areas where cover and nesting space is available, and preservation of needed habitat throughout the state. For waterfowl the story is the same. Marshes and wetlands are developed on Department lands protected on private or other public lands.

These habitat protection and improvement programs do not guarantee that a bird will not freeze or that its nest will not fail, but they do help maintain a strong population that can bounce back from bad years.

For coho salmon, habitat protection and stream improvement is a constant activity for Department workers. Now, with the Salmon Trout Enhancement Program running at a good level, the public is also pitching in to see that spawning beds are protected and that once useless areas are restored to productivity. But the coho crisis also involves research. Why do these fish not survive while chinook salmon populations are doing fine? A recently completed comprehensive coho management program plan calls for improved quality hatchery smolts, extensive studies on the best time to release the fish from hatcheries and continued efforts to save wild populations through stream habitat protection and harvest regulations.

The coho declines are not just an Oregon problem. Similar problems are appearing in Washington, British Columbia and Alaska. The concentrated efforts of fisheries scientists in all those areas are being brought into the fight to turn the situation around.

The tendency to place blame for a serious problem is a natural human reaction. the successive bad coho years, culminating in ocean recreational and commercial seasons this year, has led to a lot of finger pointing.

Some critics have accused the Department of intentional mismanagement. In a recent speech, Department director, John R. Donaldson, called the accusations "Bilge!" He also noted that public hatchery production is materially unchanged from the same levels that produced the coho bonanza in 1976.

Increased production alone is not a cure all since recent adult returns have steadily declined in the face of high production levels.

Like the gentlemen at the luncheon, Department researchers, field biologists and hatchery workers want coho populations to be healthy again, and they are using every tool in the management kit to accomplish that goal.

Research Integration Into Management Was Conference Objective

September 9-10, 1982 marked the beginning of biennial conferences on "Research in California National Parks," sponsored by the Cooperative Parks Studies Unit, Davis, and hosted by the University of California at Davis. The theme of this conference was "the integration of research into National Park Resource Mangement Decision-making," with a major aim of helping researchers and managers to better coordinate their respective expertise.

More than 150 participants listened to papers from 76 scientists who had conducted research in a California National Park. Topics dealt with California plant communities, geology, water quality, forest rehabilitation (particularly in Redwood NP) California mammals, birds, fish and amphibians. Also dealt with were the effects of fire on the ecosystems of California's National Parks, and the scientific study of lakes, ponds, and streams. A number of papers were concerned with visitors in the parks — their perception of park areas and the impacts they are having on various resources, backcountry campgrounds in particular.

In addition to the paper sessions, one evening was spent viewing 15 poster presentations and 3 NPS films on the Channel Islands and Sequoia & Kings Canyon NPs. Sections of each day were devoted to panel discussions in which participants discussed how research was implemented into management decisions in their respective expertise areas. Panel members consisted of NPS research scientists, resource managers, and superintendents, in addition to university and other governmental agency personnel. The closing panel, chaired by Dr. David Parsons from Sequoia & Kings Canyon NP, dealt with positive aspects of the conference and how it might be improved in future years. In all discussion sessions, the audience was invited to participate.

Key-note speaker was Dr. Roderick Nash, a professor of history at the University of California at Santa Barbara, and a noted historian of the National Parks. Dr. Nash stated that National Parks reflect the social and cultural values of society, and that these values have changed over the past century. In taking the audience through a historic tour of National Parks, from their inception to the present, he stressed that many of the mistakes park managers have made in the past were a direct result of their responding to the needs and desire of the public at that time. For instance, in the early stages of the National Park Service, people wanted a resort-type of situation. The grandiose hotels still extant in many of the parks reflect that period's desire. Also, people then wanted to lounge around and at the same time be able to view the wildlife. Bear feeding was instituted as a result. Today, visitor desires have shifted in the direction of more wilderness experience, leading to elimination of the bear feeding programs and emphasis on preserving the natural conditions of the National Parks.

Limited copies of abstracts of the conference are available from Dr. Charles van Riper III, Unit Leader CPSU/UCD, Institute of Ecology, Wickson Hall, University of California, Davis, CA 95616. The proceedings of this conference will be published by the CPSU and the Institute of Ecology at UC Davis, and is expected to be ready by late 1982. Copies may be purchased by contacting Dr. van Riper.

Regional Highlights

North Atlantic Region

The **Barrier Island Forum and Workshop Proceedings**, based on the May 1980 meeting, now are available for $10 from Cape Cod National Seashore, South Wellfleet, MA 02663. The 207-page book, with full color cover, contains 17 papers, introductory material, and 27 pages of transcript of a problem-solving, brain-storming session held during the conference.

Pacific Northwest Region

"Foreign Visitors at Grand Canyon NP: A Preliminary Study," is the title of the University of Idaho CPSU Study No. S82-2 by Gary E. Machlis and Ellen L. Wenderoth, available from Dr. Machlis at UI/CPSU, Moscow, ID 83843. The study focused on organized tours to the South Rim, using four different research methods: a time-budget analysis, a questionnaire in French, Japanese, German, and Spanish, participant observation, and informal interviews.

After observing 40 tours (1,440 observations were made) and tallying the 89 percent response from the questionnaire (908 responders), it was found that 19 percent of the average tour's time was spent on park-oriented activities such as viewing scenery and interpretive facilities, taking pictures, and so forth. In contrast, 33 percent of the tour was spent traveling from place to place and 23 percent was devoted to eating in restaurants.

The CPSU study describes the research, including an appendix with all the questionnaires in each of four foreign languages, and contains 37 specific recommendations for consideration by NPS management and Grand Canyon NP concessionaires. The recommendations cover information services, interpretation, visitor protection, and general visitor services of the kind provided by concessionaires.

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The 1981 year of operation, with emphasis on knowledge and technology transfer, is described in the *1981 Annual Report* of the NPS/CPSU at the University of Washington, now available from PNR Headquarters, Seattle, WA. A wide range of projects in both sociology and biology are described, and planning has been completed for release of a continued series of reports for public land managers.

Alaska

The 1982 Bear Bibliography project now is available in both hard-copy (8½ x 11) and microfiche form, according to word from the University of Alaska CPSU. The Brown Bear Bibliography contains 4,154 citations; the Black Bear Bibliography, 3,569. Each has been extensively keyworded and includes vocabulary listings for title and keyword fields as well as indices by author and keywords. A complete user's manual and description of the project is included with each bibliography.

Copies can be obtained from Alaska Cooperative Park Studies Unit, Biology and Resource Management Program, 211 Irving Bldg., 902 Koyukuk Ave., North, University of Alaska, Fairbanks, AK 99701. Cost and search information regarding the bibliographies also can be had by calling Teresa M. Jordan, administrative assistant, at (907) 474-7672.

Southwest Region

Regional Director Robert I. Kerr has announced reestablishment of the Cooperative Park Studies Unit at A&M University. Director Kerr indicated that the Unit would become operational in October 1982, and he expects the Unit to begin to play a major role in the science activities of the Southwest Region. The A&M Unit will be housed in the Department of Recreation and Parks, within the Experimental Station of the College of Agriculture.

Chief Scientist Milford Fletcher will have primary responsibility for the Unit's

operation. Dr. Fletcher recently negotiated a Revised Memorandum of Understanding between the Region and the University, laying the groundwork for a diverse program of biological and sociological scientific work.

Dr. Robert F. Newkirk will direct the new Unit. A graduate of the University of Maryland, he has eight years of Interior experience in a variety of parks and recreation programs. Although biological projects in support of the Regional parks will be the priority emphasis of the Unit, Dr. Newkirk has expressed interest in expanding research priorities to include much needed visitor profile data, revenue impact studies, and sociological carrying capacity studies on the Region's rivers trails systems.

Correspondence to the new Unit should be addressed to:

Dr. Robert F. Newkirk, CPSU Director, Department of Recreation and Parks, Texas A&M University, College Station, Texas 77843-2261

Midwest Region

What probably is the oldest mammalian den complex ever found was uncovered in Agate Fossil Beds NM, Gering, Nebraska, by Dr. Robert Hunt, Jr., and three student assistants this summer. On the side of a weathered outcrop a mile south of the Niobrara River, they found two prehistoric "bear-dogs" (Dapheonodon) and evidence of several underground dens where the animals lived. Bear-dogs roamed the flat plains of western Nebraska 20 million years ago, and were the dominant species in North America at the time. Their size ranged from that of an Irish setter to a small grizzly bear. Hunt was even able to match up the bones from his recent find with those uncovered in 1905 by Olaf Peterson of the Carnegie Museum, and in addition discovered that two burrows led to the spot where Peterson had made his find. Dr. Hunt is returning to do more field work this fall, and will do a complete story on the bear-dogs for a future issue of *Park Science*.

Southeast Region

Great Smoky Mountains NP held its Eight Annual Scientific Research meeting at the Park's Tremont Environmental Education Center Near Townsend, Tenn., on June 24 - 25, More than 70 attended, including agency and institutional officials from the Tennessee Valley Authority, U.S. Fish and Wildlife Service, Oak Ridge National Laboratory (operated by Union Carbide Corp.), the U.S. Army Corps of Engineers, and EG&G Idaho, Inc. (Idaho National Engineering Laboratory). Academic representatives came from the universities of Tennessee, Maryland, Rochester, North Carolina State, Cornell, Georgia, Clemson, Ohio State, Pennsylvannia, Bowling Green, Tennessee Tech and Western Carolina.

Forty-six research papers were given, covering the ecological spectrum from vegetation, wildlife, air quality and water quality to geology, soils, and atmospheric precipitation. Several social science papers also were given. Most of the Presentations centered on current research within the Great Smokies and the immediate surrounding area, but seven other parks, (Buffalo River, Shenandoah, Blue Ridge Parkway, Big South Fork, Cumberland Gao, Obed Wild and Scenic River, and Acadia), also were covered.

Discussions on black bear research, air and water quality monitoring activities, and acid precipitation effects research allowed participants to exchange information and to familiarize themselves with research, monitoring, and development needs of the southern Appalachian region. Supt. Dave Beal's welcoming address dealt with the application of scientific information to park management.

The proceedings will be published by the Southwest Regional Office in August.

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A Workshop of National Diversity in Forest Ecosystems will be held at the University of Georgia's Center for Continuing Education in Athens, Nov. 29 through Dec. 1, 1982, according to Jay Gogue, Regional Chief Scientist for the Southeast Region. Gogue will moderate the panel on Forest Recreation and Cultural Resources on Nov. 30. Appearing on the panel will be Peter S. White, research botanist, Great Smoky Mountains NP.

Western Region

The U.S. Fish and Wildlife Service has recommended Charles van Riper III, unit leader of the UCal/Davis CPSU, as a member of the Peregrine Falcon Recovery Team for the Western United States. Van Riper will serve as the National Park Service representative on the team.

Five of van Riper's papers concerning research on Hawaii's ecosystems, completed while he was working at Hawaii Volcanoes NP, are now available in reprint form from the author, Wickson Hall, University of California, Davis, CA 95616.

"Within-Territory Division of Foraging Space by Male and Female Amakihi (*Loxops virens*)," written with Alan C. Kamil, appeared in *Condor* 84:117-119, 1982, publication of the Cooper Ornithological Society; Summarizing Remarks on "Comparison of Methods" appeared in *Studies in Avian Biology* No. 6:217-218, 1981; a book review of *The Hawaiian Goose: An Experiment in Conservation*, by Janet Kear and Andrew J. Berger, appeared in *The Wilson Bulletin*, Vol. 93, No. 3, September 1981; "The Phenology of the Dryland Forest of Mauna Kea, Hawaii, and the Impact of Recent Environmental Perturbations" was in *Biotropica* 12(4): 282-291, 1980; and "Observations on the Breeding of the Palila *Psittirostra bailleui* of Hawaii," was carried in a 1980 issue of *Ibis*, journal of the British Ornithologists' Union.

Michael Frome Joins UI Faculty

Michael Frome, award-winning conservation author and columnist, has joined the University of Idaho faculty for a one-year term as writer-in-residence as Visiting Associate Professor of Communication and Wildland Recreation Management.

Frome is the author of more than a dozen books on travel and conservation topics. These have included *Whose Woods These Are, The Forest Service, The National Parks, Battle for the Wilderness* and *Hosteling USA*. He has also served in a variety of writing and editing positions with the *Washington Post, Los Angeles Times* and the *International News Service*, and as conservation editor and columnist of *Field & Stream.*

Frome will teach courses in the School of Communication on public affairs reporting and news writing. He will be housed in the College of Forestry's Department of Wildland Recreation Management. He is working on the preparation of two more books on parks and natural resources.

Coral Reef Research Reprints Prove Popular

The 15-page article on "A Century of Natural Change in Coral Distribution at the Dry Tortugas: A Comparison of Reef Maps from 1881 and 1976," by Gary E. Davis, is now available in reprint form from Davis at Channel Islands NP, 1901Spinnaker Drive, Ventura, CA 93003. The reprint includes two handsome full color maps of the Dry Tortugas, the 1881 map according to Alexander Agassiz, and the 1976 map according to Marine Biologist Davis.

The paper describes major changes in coral species distributions and reef types, the natural dynamic nature of coral reefs, and the role played by occasional short-term, extreme climatic events in shaping reef structure and species distribution. It also discusses the importance of protecting living corals and the value of ecosystem level sanctuaries as dynamic standards. More than 200 reprint requests have been received from 35 countries, which, according to Davis, makes it "very popular by my standards."

A ONE PAGE SUMMARY FOR RESOUI

Resource Management Plan User Table for

SYSTEM	RESOURCE BASIC INVENTORY	NATURAL INFLUENCES	HUMAN INFLUENCES
AIR	No Data Base Corrosive Atmosphere	Assumed to be little	Air Pollution - Industrial, Vehi Aircraft
WATER	Laguna Madre - Excellent Gulf of Mexico - Adequate Fresh Water - Insufficient	Laguna Madre-Water Circulation, Salinity Gulf - Assumed not to be significant	Boating, Oil & Gas Operations Oil Spills, Litter, Human Wast
GEOLOGY (SOILS)	Excellent	Ponds - Drought/Flooding, Oxygen, PH Hurricanes	Vehicles, Pedestrians, Oil & Ga Operations, Roads & Utilities
ABIOTIC OIL & GAS MINERALS	Geophysical Base - Insufficient	None known at present All Historic	Extraction
CLIMATE	Good General References Fire Weather - None Microclimates - None	Hurricane effects known Many variables unknown	Hurricane Manipulation, Cloud Seeding
FIRE	General Information - Excellent Historical Data - Insufficient	Lightning Fires - Frequency Intensity	Fireworks, Accidental Ignition Suppression, External Encroa
TERRESTRIAL	General Information - Adequate Historic Data - Insufficient	Population Dynamics Succession	Visitor Use, Oil & Gas, Suppression of Wildfire Sea Oat Collectino
UNIQUE (endangered, threatened)	Tamerisk known, Landscaping Vegetation known, Others suspected.	Not applicable at this time	Introduction of Exotic Species
FLORA (endemic, exotic)			
MARINE	Excellent overall Update sea grass distribution in Laguna Madre needed	Succession - Limited knowledge	Oil & Gas Operations, Dredgin Boat Operation, Sport & Comn Fishing, Oil Spills
BIOTIC UNIQUE	Not endangered or threatened	Not applicable at this time	Unknown
TERRESTRIAL	General Information - Adequate Historical data - insufficient	Population Dynamics- Limited knowledge	Visitor Use, Oil & Gas Operati Mosquito Abatement, Insect Pest Control, Suppress of Wildfire.
UNIQUE	Peregrine Falcon - excellent Transient Exotic - deficient White Pelican - adequate	Population Dynamics — Limited Knowledge	Visitor Use, Oil & Gas Ops., Aircraft, Illegal Capture, Trar Transient Exotic, Feral Dogs Garbage, Parasites
FAUNA			
MARINE	Excellent	Salinity Oxygen Levels PH	Visitor Use, Boat Operations, & Gas Ops., Sport & Commerc Fishing, Oil Spills, Poaching
UNIQUE	Kemp's Ridley Sea Turtle - adequate Loggerhead Sea Turtle - adequate Marine Mammals - adequate	Nesting / Not Nesting	Commercial Fishing, Collectic Poaching, Harrasment

This table is a summary of the Park's Resource Management Program.

To use the table, simply ask yourself which subject you are interested in. If it is geology for example, the next column provides an evaluation of the knowledge of the system. Four categories have been chosen:

Excellent — Satisfies all present and anticipated future needs for resource information on which to base management actions.

Adequate — Satisfies all present needs for resource information on which to base management action.

Insufficient — Indicates a lack of knowledge specific to Padre Island. Such information would be needed before a management decision could be made.

Inadequate (No data base) — Indicates a lack of information on the sub general as well as specific to your area.

None of the above presuppose that the information is not available fr just that it has not been located nor is it available on site for manag

To find out the actual extent of the knowledge, consult the Bibliograp subject.

Known natural and man-related influences on the subject are indicat columns.

The documentation of man's influence (next to the last column) indi documentation is available.

Visual — Indicates that a trained person can go on- visually recognize the influence.

CE MANAGEMENT PLANS

'adre Island NS

DOCUMENTATION OF HUMAN INFLUENCES	NEEDS (PROJECT NUMBER) CATEGORY A	B	C	D	E
Some visual, otherwise none		N-005	N-012 N-013		
Visual - good Plans of Operation - good Research - weak	N-001 N-002	N-005	N-009 N-011 N-014		N-025
Visual - good Research - fair to good	N-001 N-002	N-005 N-008	N-010 N-011		N-018 N-020 N-021 N-025
Plans of Operation - good Extraction Records - good	N-001 N-002	N-005	N-010 N-012		N-025
None Available			N-011		N-024
Fire Reports - good for past 10 yrs. Visual - fair to good Research - weak		N-005		N-015 N-016	N-025
Research - fair to good Visual - fair to good Plans of Operation - good Documentation - weak	N-001 N-002	N-005 N-006	N-009 N-011	N-015 N-016 N-017	N-018 N-021 N-025
Visual - good Research - none	N-001 N-002	N-005 N-006	N-009 N-011	N-015 N-016 N-017	N-018 N-021 N-025
Visual - fair to good Research - fair to good Plans of Operation - good Documentation - weak	N-001 N-002	N-005 N-006	N-009 N-011		N-019 N-020
None	N-001 N-002	N-005 N-006	N-009 N-011		N-019 N-020
Visual - fair to good Research - fair Plans of Operations - good Documentation - fair	N-001 N-002	N-005 N-006	N-009 N-011	N-015 N-016 N-017	N-018 N-021 N-022 N-025
Visual - weak Research - fair Plans of Operations - good Documentation - weak to fair	N-001 N-002 N-004	N-005 N-006	N-009 N-011	N-015 N-016 N-017	N-018 N-021 N-022 N-025
Visual - weak Research - fair Plans of Operations - good Documentation - fair to good	N-001 N-002	N-005 N-006	N-009 N-011		N-019 N-020
Visual - Weak Research - fair Documentation - good	N-001 N-002 N-003	N-005 N-006 N-007	N-009 N-011		N-019 N-020

Plans of Operation — Indicates that the influence is documented in an approved oil and gas Plan of Operation.

Research — Indicates that the influence is documented in research literature (see Bibliography)

Extraction Records — These records are maintained by the Oil company. The information may be available through a state regulatory agency.

Documentation — Indicates the relative value of the information in the documented sources noted.

The last column *Needs (Project Number)* lists the resource management project numbers for current and projected needs. Projects are listed by major priority categories (A, B, C, D, E). Information about the action is contained in the Project Statement.

By William M. Lukens
Superintendent, Padre Island N.S.

Since 1968, I've been fighting the Battle of the Resources Management Plan. One of the problems which constantly arises is determining to the satisfaction of everyone — user and reviewer — how much detail is necessary. The solution we've come up with is the use of a table which summarizes the significant parts of the Plan in one page for the reader, yet allows the user to incorporate all the information he needs into the body of the Plan.

The Plan user has reviewed a great deal of information and literature in the preparation of the Plan. Much of the data accumulated and any references located are needed in order that the Plan be executed consistent with the findings. Sometimes 4 or 5 years may pass between the time the Plan is written and various phases are executed. Personnel have changed. To relocate the information is time consuming and in some instances, impossible. The reader reviewer, on the other hand, generally is not interested in detail; he wants pertinent facts. Yet reviewers, who have approval responsibility, want some assurance that the data presented is backed up in writing.

The method of presentation we've developed uses the generally accepted taxonomic classification (kingdom), but this can be modified down to species if the need exists. We have defined the term unique (endangered, threatened, endemic, exotic) as "peculiar to Padre Island" in contrast to the dictionary definition of "one of a kind."

The major headings of the table pose questions concerning the systems. What do we know about each system? What are the natural influences on the system? What are the human influences on the systems? What documentation is available to substantiate influences? What is needed (Projects) to answer the questions or to mitigate influences so the system can function in accordance with resource management objectives.

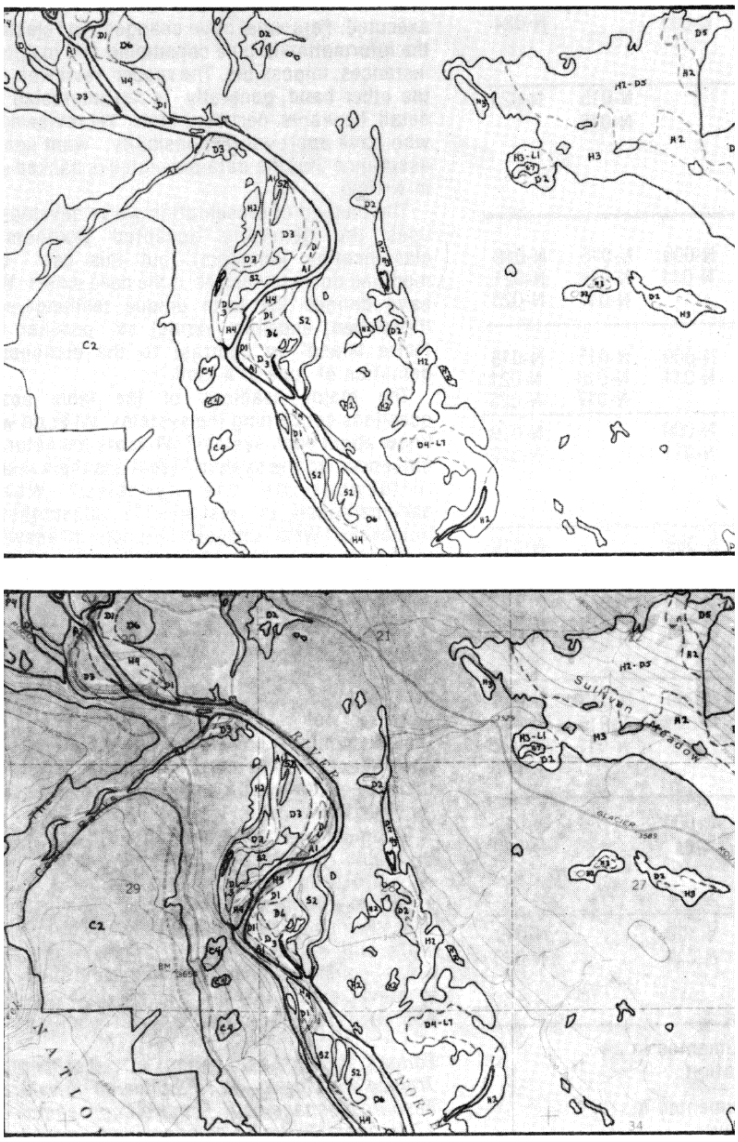
Accompanying the table is a series of definitions for the terms used: excellent, adaquate, visual, etc. The bibliography is arranged by systems. Cross referencing by key word has not been done but would be helpful. Project numbers have been duplicated where one project satisfies more than one need. Listing the project title would be more informative but requires too much space.

Comments on the table have been very favorable. The biggest weakness is lack of standardization servicewide. If each area had a one page summary similar to this, then in most cases Region and WASO offices would be able to work with the one page summary while the areas could continue with the full plan at whatever depth they felt necessary. A similar approach is applicable to cultural resources.

Editor's Note: Last spring a Departmental Trainee working in the NPS Division of Natural Resource Management, Richard Coon, sampled 17 National Parks to compare high priorities (SRPs) with Project Statements identified in the RMPs , and to determine if the high priority threats are being adequately addressed in the RMPs. Coon found "great variability in classifying projects," which he noted "may lead to confusion as the RMPs are used." His conclusion was that more instructional material may be needed "aid in standardizing the classification of projects as to management, monitoring, or research."

Glacier National Park Scientist Refines Low-Cost Resource Mapping Alternative

Editor's Note: The Flathead River Basin Riparian Study Team, under the direction of Dr. R. Gerald Wright, CPSU leader at the University of Idaho, is in the final year of an 18-month study, funded by EPA through the Flathead River Basin Environment Impact Study, to inventory riparian communities and investigate specific impacts within the River corridor. Carl H. Key, biological technician at Glacier NP, in January 1982 completed a resource map series for the project, using the method he describes below. Key now is completing a Landsat project for the Park and working to develop a digital resource information system. A full color Landsat picture of a 75-square mile area of Glacier NP and a description of the technique's applications appears on page 7, October issue, **Science 82.**



***Transparent overlays** such as the two shown here can be registered on a USGS topographic map to display the relationship of such information as is desired. The upper overlay identifies natural non-forest communities (labeled A, D, and H) and logged areas (C and P). The lower overlay incorporates the relationship of land type to geographic relief and information that allows monitoring of changes in the river channel. A forest types overlay has been prepared, and a final overlay of tributary streams and roads has been drafted and could be added, to document drainage patterns and access.*

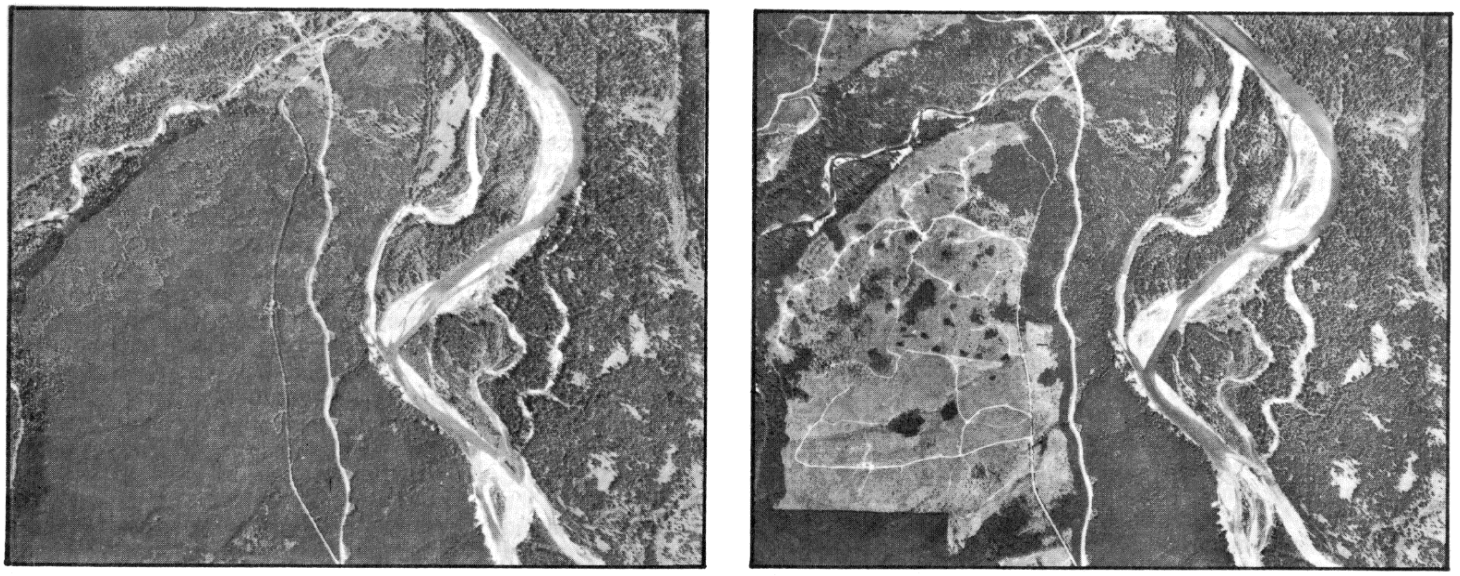
By Carl H. Key

The proliferation of remote sensing technology and digital cartography has produced a multitude of useful and exciting tools for resource management. The need persists, however, to apply what some might view as "archaic methodology" to synthesize resource information in low-budget, short-term situations. Managers of small parks, researchers studying a relatively small area, and managers confronting an immediate problem need to gather and manipulate resource information without investing large sums of money, time, and expertise. The resource mapping alternative described below, minimizes the latter quantities while developing a useful product. It applies a simple projection/tracing method to map directly from aerial photographs and achieves proper scale with minimum distortion.

Limitations, Results and Applications

As with all mapping techniques, limitations exist. Some of the method's timeliness is lost if the analyst must undertake extensive ground surveys to become familiar with the environment. Appropriate photography also must be available. The method works best when applied to high altitude and medium to small scale imagery. Large scales are acceptable, however, where typography varies less than 305m (1000 ft) elevationally. No limit to map scale appears to exist as long as image features are adequately resolved and the map draft is sufficiently controlled. The technique should be tested beforehand by mapping a small area and verifying the results against a USGS topographic map. A measurement of map accuracy can then be made. My experience has shown that 1:24,000 scale maps produced from 1:30,000 scale high-altitude imagery are geometrically accurate to 0.5 mm (map distance) when carefully drafted.

Overshadowing these limitations is the fact that resource maps produced by this method are easy to draft, inexpensive and versatile. The Flathead River Basin Riparian Study Team invested less than 60 man days and $200 in materials to produce land cover maps for portions of the Flathead River corridor (figure 1). Six map series at 1:24,000 depicting five unique environmental components (a total of 30 overlays) were completed for the 690 sq. km study area. The image source was a set of U2 color infrared transparencies at a nominal scale of 1:30,000. Twenty five polyester and 60 ozalid reproductions



Two aerial photographs of the identical site within the North Fork study area. The left photo was made August 2, 1965; the right photo, June 30, 1977. Taken about a decade apart, they illustrate measurable impacts to vegetation, as indicated by the recent clear cuts in the photo on the right. Increased road access, changes in the river channel, and vegetative succession on the floodplain are also detectable. Resource map overlays help quantify such changes and provide the manager with an effective monitoring capability. In the photos, Glacier National Park lies to the right of the River.

were made at low cost. Overlays were produced singly and in combination to evaluate relationships between two or more environmental components (i.e. legend hierarchies). Ozalids were used as base maps for transparent overlays, and were colored, written on, and taken in the field without the risk of irretrievable loss or damage.

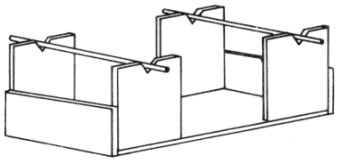


Figure 2. *A simple adaptor, constructed from 1 x 12 inch lumber, sits under the projector and dispenses film rolls of large-format transparencies. Overall dimensions may vary depending on projector and film size.*

mapping objective (See Baily, R.G., R.D. Pfister, and J.A. Henderson. 1978. Nature of Land and Resource Classification — A Review. J. of Forestry 76 (10):650-655.) When the legend has several hierarchies (a complex environment), for example, a system of overlays, one for each major hierarchy group, should be planned to simplify map interpretation and provide a means for evaluating related components. Only with an appropriate legend and a concept of the map's purpose and structure can the analyst proceed confidently to the mechanics of map drafting.

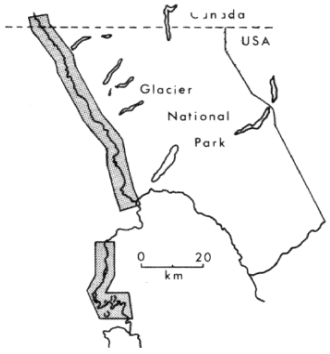


Figure 1. *A map of the study area along the west boundary of Glacier National Park and above Flathead Lake, Montana.*

Prior Considerations

A major objective of resource mapping is to maximize relevance, accuracy, and practicality. The following relate directly to that objective and must be determined before initiating any mapping project: 1) the map's purpose; 2) the environmental components that are both identifiable and relevant to that purpose; 3) the scale and type of imagery that most faithfully resolve the relevant components; and 4) the map structure or organization that leads to easiest interpretation.

To facilitate map planning, a basic legend should be constructed beforehand; preferably one that fits a hierarchical design. In that form, it groups components in a manner that displays relationships, indicates environmental complexity, and enables the analyst to efficiently determine the requirements of the

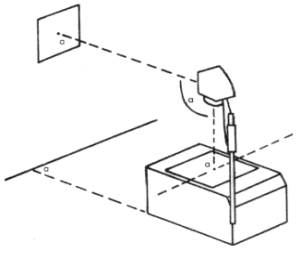


Figure 3. *To minimize distortion, the straight edges of a small square wall target should parallel the edges of a projected image. An accurate bubble level can be used initially to orient wall target and projector so angles (a) are 90 degrees. Move the projector away from or toward wall to adjust scale.*

Glacier National Park Scientist

Materials and Methods

The materials needed to complete this technique include standard drafting instruments, velum, matte-polyester drafting film, USGS topographic maps, aerial imagery, and a quality projector capable of projecting the imagery. Any or all components can be adapted to suit a particular situation, while making maximum use of available or inexpensive hardware and supplies. If aerial photos do not fit conveniently onto the projector's platen, for example, construct an adaptor (fig. 2) but take care to adequately vent the platen so images remain cool during long periods of projection.

The mapping procedure involves projecting a land image without distortion at a desired scale onto matte polyester or velum and simply outlining the features of interest. First, the projector is oriented correctly relative to a wall or other projection surface, and the image is approximately scaled (fig. 3). Next, a matrix of control points is traced onto velum from appropriate topographic maps and placed on the projection surface. The image is then adjusted precisely to the control sheet so that controls on the imagery match or overlay their conjugate points on the control sheet. In that state, the image is at the desired scale with minimum distortion.

Control points must be readily identifiable on both maps and imagery, evenly distributed throughout the map area, and sufficiently numerous to represent the true plan position of vertically displaced points in the scene. Since the method's accuracy depends on adequate geometric control and correct projector orientation, careful attention to the above is a necessary prerequisite to drafting.

A sheet of matte polyester film is then placed over the control sheet and appropriate features are drafted in blue pencil from the projected image. Generally, all areas of the image can be mapped within the bounds of matching control points, increasing in size with higher photo altitudes and smaller scales.

To proceed to the next photo, realign points on the control sheet with controls on the imagery, reposition the map draft, and continue drafting. Partially overlap a new image with a region that was drafted previously to insure uniformity between images and consistency throughout the map. The process is reiterated until all areas are mapped.

Overlays should be drafted in sequence using the same image position to insure that lines on sequential overlays begin and end at correct points. Accuracy should be checked periodically by placing the drafts over the appropriate topographic map.

When completed, map drafts are placed on a horizontal surface, retraced in ink, labeled, and geographically referenced to matching topographic maps. Either the first draft, or a clean sheet of polyester can be used for the final product. Various colors or line types can be applied to highlight certain features. Again, overlays should be finished in sequence, stacking one on the other while maintaining their correct relative position.

Currently, the study team is using the maps to locate transects to proportionately census available habitat for animal abundance, distribution and movement. In the future, the team plans to quantify, with a digital planimeter, the amount of available habitat for selected animal species, describe the relationship between the available habitat and animal distribution, and define the effect of human disturbance on habitat availability.

The overlay system produced by this method is easy to amend and add to for future reference. All features can be digitized and contribute to a computerized information system (in fact, manually produced resource maps are usually the necessary source of digital cartographic information). When superimposed on topographic maps, these overlays provide an understanding of natural plant community distribution as it relates to terrain and hydrology. When compared to older photography or previous resource maps, these can be used to estimate changes in landuse and monitor vegetative succession, thus establishing a baseline for multiple environmental components.

Letters to the Editor

To the Editor:

I find your excerpts in **Park Science** Vol. 2 (4):17, of Norman L. Christensen's review of the NPS Scientific Monograph Series that appeared in Ecology (Vol. 63(2):601-602), most interestisng and worthy of further comment.

Christensen points out the worthiness of these publications to the scientific community and their impact on shaping and interpreting Park policy on resources management matters. His final statement, "these volumes represent an appropriate vehicle for synthesis of that research and deserve more attention than they have received," is a gem and should be called to the attention of those persons managing the Research Grade Evaluation Program.

It is my understanding that during research grade evaluation NPS scientists receive higher point values for papers published in professional journals than those published in Servicewide, Regional, and Park publications. I hope that Christensen has set a trend for more periodic reviews by the scientific community of Service publications on research/resources management matters. In many instances, these latter publications can have as great, if not greater, an impact on the development and implementation of NPS resources management policy as that resulting from professional journal publication.

Garrett A. Smathers
Senior Scientist
NPS/CPSU
Western Carolina University
Cullowhee, NC 28723

To the Editor:

I read with interest "Composting:Solve a Problem and Create a Useful Product," in the Summer 1982 issue of **Park Science.** There's considerable evidence that toilet deodorant chemicals interfere with biodegradation of sewage. I think that J.C. Patterson and J.R. Short (and perhaps other readers) would be interested in **"Recreation Vehicle Waste Disposal in Roadside Rest Septic Tank Systems,"** in which the effects of various toilet chemicals on biodegradation are explored.

The report is one I have found to be very practical and multipurpose, and it deserves the attention of any park that has to deal with RV/portable toilet wastes. The authors are F.H. Pearson, D. Jenkins, H. McLean, and S.W. Klein. It was published in 1980 and can be ordered, for $6, from Regents of the University of California Sanitary Engineering and Environmental Health Research Laboratory, Richmond Field Station — Bldg. 112 47th and Hoffman Blvd., Richmond, CA 94804.

Steve Zary
NPS, NERL/CSU
Fort Collins, CO 80523

Errata

The family names "Embioticidae" and "Hexagrammidae" were erroneously italicized in Jeffrey C. Laufle's story on "Biological Studies and Materials Comparisons on a Puget Sound Artificial Reef," appearing in the Summer issue (Vol. 2 No. 4) of **Park Science.**

Germplasm Bank Network Grows

The first of what eventually will be a network of 12 clonal crop germplasm banks for agricultural researchers and genetic engineers now is a fully-staffed, going concern at Oregon State University in Corvallis. This unit joins the Regional Plant Introduction Stations and the National Seed Storage Laboratory, which have been maintaining seed propagation crops since the 1940's.

Construction of the Northwest Plant Germplasm Repository (NWPGR) began in 1979, nine years after a Southern corn-leaf blight destroyed half the corn crop in some states. The collection and preservation of thousands of varieties of germplasm (the cellular material that determines plant and animal heredity) is being undertaken in part as insurance against similar near disasters that are bound to occur again. A diversity of genetic materials will be on hand in the banks to provide disease-resistant strains or substitute crop plant as "tide overs" while researchers use the germplasm repository materials to design and reshape through genetic engineering the characteristics of the plants in question.

The chain of repositories is being established under the aegis of the Department of Agriculture, which has awarded the project a high priority underlined by a one-third increase in the proposed budget.

Naturally, the concern for vulnerabilty in crop plants is of paramount interest in this USDA project. However, Otto Jahn, curator, and N.M. Westwood, horticulturist and research director at the OSU facility, are very much interested in maintaining working contact with other agencies such as the National Park Service as sources for wild plant species.

Both Jahn and Westwood are involved periodically in searches for native wild species connected with small fruits, pears, hazelnuts, hops and mint . . . the species toward which the Oregon facility work is oriented. Inside the series of screenhouses and greenhouses sit row on row of pear, hops, strawberry, blueberry, cranberry, and other plants, each tagged with the data describing its pedigree and origin. Specifically, the NWPGR is charged nationally with collection, evaluation, maintenance, and distribution of clonal germplasm for the above listed species. Laboratories for tissue culture and plant analysis are presently being equipped for use in propagation and germplasm evaluation.

The plants come from all over the world. Last year, Westwood spent 48 days collecting in Japan, Taiwan, and Korea, and returned to Corvallis with more than 200 seed collections of fruit and nut species, representing 29 genera. However, the exhilaration of this horticultural coup was somewhat dimmed by the fact that at least seven of the species he sought appear now to be extinct in the wild . . . three apples, *Malus floribunda, M. taconoskii,* and *M. asiatica,* and four pears, *Pyrus aromatica, P. hondoensis, P. kawakamii,* and *P. dimorphophylla.* The *Pyrushondoensis* still exists as a very few trees growing at the OSU facility — products of seeds sent to Westwood in 1968 by a professor at Kyoto University who collected them in the foothills of Mt. Fuji. Westwood said he also had a few of the *dimorphophylla* pear trees growing at the repository. All of these seven species now seem to have been reduced to a few clones growing in arboretums or collections.

Westwood journeyed to an old orchard near Seoul on the last day of his 1981 trip to see for himself whether a reported orchard of *Malus asiatica,* the only edible native apple of Asia, actually was that species. "I suspected," he said, "that it would turn out to have been hybridized by European strains of apples. But when I arrived I found an orchard of crisp, sweet, oblate apples, one tree of which was more than 100 years old. This predates the introduction of European stock into Asia and I had to conclude that the orchard was authentically *Malus asiatica* in origin."

He described the old tree at the edge of a hill, its trunk no more than 20 centimeters in diameter. The ancient specimen had been planted more than a century before by the owner's great grandfather, and had survived all those years on a sterile granite slope. "It really was a great find," Westwood said. "Especially after having failed at all previous turns. It made my trip."

Both Westwood and Jahn expressed interest in the Man and The Biosphere Project 14, worldwide biosphere reserves, as a measure for continuation of speciation — the gradual process by which species evolve into new forms. National Park natural areas and the world biosphere reserves are among the remaining protected sites where wild plant species still can continue their contributions to some future world and its needs.

Jahn will be traveling to Scotland, Germany, Denmark, and Sweden late in the summer to attend meetings and do some collecting. Westwood will be visiting three universities in mainland China at approximately the same time.

Because so many species, most of whose characteristics still are unknown, are disappearing forever, the first priority for both Jahn and Westwood is to identify the most endangered of the species known to be important to man, and to concentrate their efforts on finding and preserving them. They are using plant geography maps, worldwide, and carefully planning their exploration time, money and energies in the direction of the species seen as most useful and least likely to survive on their own.

"**Wild species** are especially valuable to us," Westwood said, "because many of them are immune to our insect and disease pests." With urban and agricultural encroachments threatening many of the Eastern Asia wild species, Westwood said he felt it imperative to focus on these species.

Otto Jahn, *Repository Curator, and Peggy Collins, Research Technician, in one of the NWPGR greenhouses.*

Germplasm

Presently the Corvallis repository consists of 40,000 square feet of enclosed floor space, 20,000 in screenhouses, about 9,000 in greenhouses, and the remainder in offices, laboratories and service buildings. The staff of 10 is now at full complement. The pilot facility stores about 1,500 individual clones, some 700 of which are varieties of pear. The total in all catagories may eventually reach 12,000.

The second link in the repository chain is nearing completion in Davis, Calif. where Dan Parfitt is curator. The mission there is to handle stone fruits, grapes, walnuts, almonds and pistachios. A third repository, still in the design and planning stage at Geneva, N.Y., will focus on apples and grapes.

Second Repository On Line at Davis

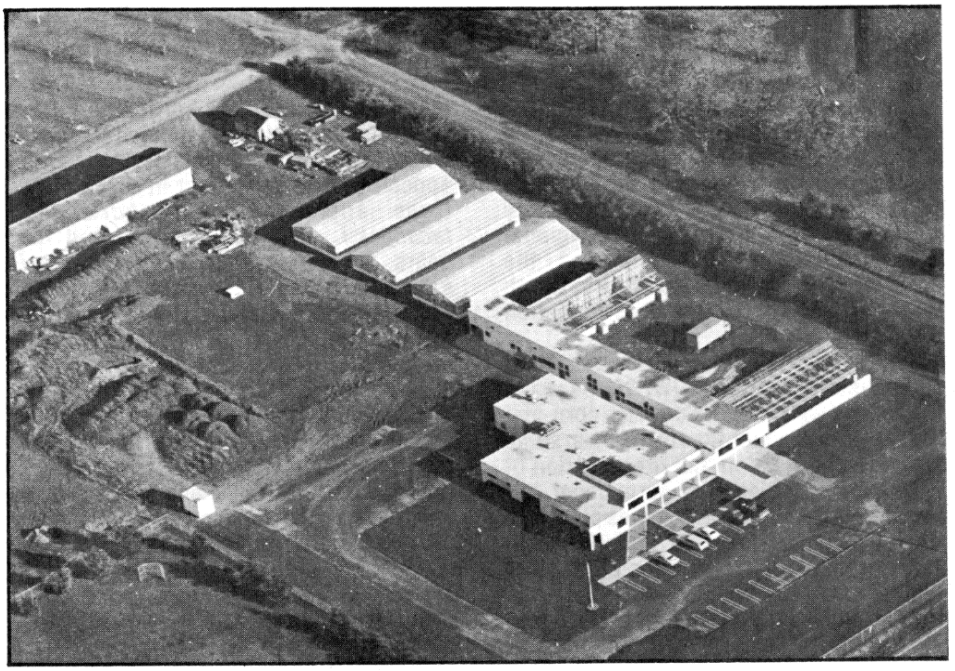
Word comes from Charles van Riper, III, leader of the NPS Cooperative Research Studies Unit at U/Cal-Davis, that the newly established fruit and nut crops germplasm repository at Davis is now operating and has accepted several collections of plant germplasm.

Four greenhouses, a lath house, screen house, labs and offices have been constructed on a two-acre site west of State Highway 113 near Davis. A diverse selection of germplasm and relevant information will be maintained at the repository, which will function as a resource for plant breeders. Research on germplasm storage methods also will be conducted.

Dr. Daniel E. Parfitt, assistant pomologist and curator of the repository, has announced that collections of genetic materials so far accepted represent figs, cherries, plums, and grapes, and "were under imminent threat of destruction."

Parfitt noted that rare varieties often are not recognized in areas where they grow wild, and that care is needed to preserve them. The disappearence of wild species, Parfitt said, "is the same as the extinction of animals, only involving a lot more species with a lot less noise."

Bill Dowler, chairman of the USDA Special Microbial Collections Committee, in Washington, D.C., reported in July the receipt from several departmental heads and representatives and from research leaders of "several thoughfully prepared letters outlining concerns, needs, and suggestions on microbial and subcellular germplasm collections." He suggested that the committee is contemplating a simple newsletter that would provide methodology, ideas, comparisions, recommendations, etc., from participating scientists.



The Northwest Plant Germplasm Repository *at Corvallis, Oregon, as it appeared at the dedication on April 15, 1981. Since then, two greenhouses and three screenhouses have been added to the facility.*

Information Crossfile

John Ciardi, poet and critic, recently discussed on public radio the "premier social climber" among all words — namely, "steward." Since the National Park Service has long been linked to the concept of stewardship, the exercise held added interest.

Ciardi traced the word back to the middle ages, where it was "steig ward," literally (in Old English) meaning keeper of the sties, or pig warden. A succession of superintendents at Great Smoky National Park would nod vigorously in acquiescence to this meaning.

Later, stewards were among the lowest of the feudal army components — those who tagged along in the rear of the military tide, without uniforms or weapons, and who moved up into action only as death and defeat made weapons available at the front. Still — a step above swine herding.

Eventually, Ciardi said, the word became the root for the Stewart line of English kings. From pig pen to castle —not a bad rise in the world of words —even if it took a thousand years.

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The beneficiaries of Preservation now have a new name in the lists — mining!

The August 1982 issue of *Scientific American* devotes 10 pages to an article by Corale L. Brierley on "Microbiological Mining," exploring the central role of bacteria in the leaching of copper from low-grade ore and other ways the minerals industry now stands to gain from the applications of novel methods of microbiological technology.

Sources include the swirling filiments of organic matter in the sulfurous hot springs of Yellowstone NP, made up of the fused cells of millions of microorganisms of various species. "Genetic manipulation of certain species found in such natural habitats may result in new strains with an enhanced capability for recovering nonferrous metals from sulfide ores or from metal-contaminated waste water," according to Brierley. Other microorganisms with extraordinary adaptability were found in the harsh volcanic environment of the Mount St. Helens crater.

The article describes the controlled use of microorganisms for the extraction of metals from ores and solid waste materials and the application of biological technology to the restoration of particulate-laden and metal-contaminated industrial waste water.

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A new 720-page book on Elk is *North American Elk — Ecology and Management*, compiled and edited by Jack Thomas of the USFS and Dale Toweill of the Oregon Dept. of Fish and Wildlife. Twenty-seven authors contributed to the book, published by the Wildlife Management Institute. The work contains 340 photos, 117 maps and figures, 100 tables, 18 original art pieces, and some 1,600 references. Copies are available from Stackpole Books, Box 1831 Harrisburg, PA 17105, at a cost of $39.95 plus $2.50 handling and shipping charges.

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Ecological Research in National Parks of the Pacific Northwest, a 150-page publication of the National Park Service, the U.S. Forest Service, and the Forest Research Laboratory at Oregon State University, contains 20 papers from the Proceedings of the Second Conference on Scientific Research in National Parks, San Francisco, 1979. The book is available through Pacific Northwest Regional Headquarters, 1920 Westin Building, 2001 Sixth Ave., Seattle, WA 98121.

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A study of the food webs and energetics of the acorn woodpecker, *Melanerpes formicivorus*, is featured in a new publication, the NLWRS *Transect*, Vol. 1, No. 1 appearing in Spring 1982. Transect is named for the line along which physical and biological data are collected, and it is published by the University of California Natural Land and Water Reserves System, 2111 Bancroft Way, Room 544, Berkeley, CA 94720. Issues of the newsletter will appear in fall, winter, and spring, and contain news of research and educational activities going on in the 26 state reserves — undisturbed areas representing the state's vast ecological diversity and designated for use as outdoor classrooms and laboratories by students, teachers, and researchers from any institution of higher education.

***

Natural History, magazine of the American Museum of Natural History in New York City, in its June 1982 issues carries a story by Joseph L. Sax entitled "Free Enterprise in the Woods." It catalogs the "vandalism of improvement" that has threatened almost every major national park through the years. Sax is a professor of law at the University of Michigan and author of *Mountains Without Handrails: Reflections on the National Parks*, published by the University of Michigan Press.

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Wildlife Digest, carries news of a natural insect "zap" similar to the electronic devices people use to keep their cookouts free of insect pests. Sunflower family members (daisies, black-eyed Susans, and marigolds) have chemicals known as polyacetylenes, that sop up sunlight and become toxic to insects. Their poison loses its punch after dark. Researchers, who do not know yet precisely how the plants convert solar energy into lethal "zap," say they have found one compound to be more toxic to mosquito larvae in the light than DDT.

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Professor T. M. Das of the Agricultural University of Calcutta, India, estimates that a tree with a normal life span of 50 years would produce about $31,250(U.S.) worth of oxygen, $62,500 in air pollution control, $3,250 in soil erosion control and additions to soil fertility, $37,500 in recycling water and controlling humidity, $31,250 in shelter for animals and birds, and $2,500 worth of protein, for a total of nearly $196,250. Add to that tree values of flowers, fruit and wood. A tree sold for commercial purposes brings less than 0.3 percent of its real value, according to Professor Das. This item appears in the March 1982 *Oregon Wildlife*, publication of the Oregon State Dept. of Fish and Wildlife, P.O. Box 3503, Portland, OR 97208.

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Roger Lewin writes a two-page Research News article for *Science* (the Aug. 20, 1982 issue) on the Darwin centennial held recently in Cambridge, England. Two paragraphs from the Lewin article have relevance to the NPS genetics conference reported elsewhere in this issue.

"Until recently, the mechanisms of genetic tinkering were difficult to imagine, said (Francois) Jacob. The new discoveries in molecular biology provide the missing material, the odds and ends. 'Now we can see that it is at the molecular level that the tinkering aspect of evolution is most apparent.'

"No one failed to be impressed by what the molecular biologists had to say. In case molecular biologists should come to believe that they now guard the route to all the important answers in evolutionary biology, Ernst Mayr cautions that 'these people must learn to think like evolutionists, to understand the importance of population effects."

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Entomologist Stephen L. Wood of Brigham Young University, Provo, UT, is the author of a 1,359-page volume, *The Bark and Ambrosia Beetles of North and Central America* (BYU Press, 1982). In 1981, the current pine beetle epidemic killed more than 13 million trees across a 4,285,000-acre in Western U.S. The loss was the same in 1980 and is anticipated to be the same again this year, according to Thomas H. Hofacker, USFS entomologist. Particularly hard hit were the fine forests in Glacier and Yellowstone NPs.

The mountain pine beetle is one of almost 500 bark beetle species of North America. The imported European elm bark beetle is the primary carrier of Dutch elm disease in North America. The southern pine beetle has been a threat to trees in the southern states, Mexico, and Central America for years.

In natural forests, bark beetles perform a vital role by weeding out aged, weakened, or injured trees and recycling dead plant tissues.

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A brand new "news journal for the plant genetic resources community" began publication in the Spring of this year (1982). Entitled *Diversity*, the publication will cover activities related to the National Plant Genetics Resources Board (NPGRB), established by the Department of Agriculture as a result of a 1973 report from the Committee on Genetic Vulnerability, (issued by the USDA and the National Association of State Universities and Land Grant Colleges). Vol. 1 No. 2 (June/July 1982) lists the U.S. Man and the Biosphere Program, U.S. Committee for UNESCO, National Park Service-sponsored International Symposium and Workshop on the Application of Genetics to the Management of Wild Plant and Animal Populations — held in Washington, D.C. Aug. 9-13, 1982. Subscription requests should be addressed to Laboratory for Information Science in Agriculture, Colorado State University, 302 Aylesworth, Fort Collins, CO 80523.

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Wildlife refuges constitute the main immediate weapon against extinction, according to Daniel Simberloff in the April issue of *Natural History* ("Big Advantages of Small Refuges") but the question of how to design such refuges is a matter of debate. Whereas a larger area (all other things being equal) contains more species than a smaller one, several smaller refuges would entail a longer total border and thus would multiply the advantages of "the edge effect." Simberloff considers the small amount of data available and finds evidence that several small refuges often contain more species than one large one. He surmises that more detailed ecological knowledge about habitat needs for various species "would likely make the advantage of several small reserves over one large one even more pronounced."

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A full-color poster, designed to assist in the identification of the endangered peregrine falcon, has been produced by the Peregrine Fund of Cornell University and can be obtained free from the Publications Unit, US Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240, or through the Peregrine Fund, Laboratory of Ornithology, Cornell University, Ithaca, NY 14850.

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The Scientist and the Communicator

Editor's Note: The following is excerpted from the opening presentation made at the Fourth Conference on Natural Sciences at the Hawaii Field Research Center, Hawaii Volcanoes NP in June 1982. Shimoda, now superintendent of Puukohola Heliau NHS and Pu'uhonua O Honaunau NHP, has served as a communications instructor at the NPS Stephen Mather Training Center, Harpers Ferry, WV.

By Jerry Shimoda

Supt. Robert Barbee (of Redwoods NP), in his notice to participants at this conference, asked that we transmit our research into easily understood language so that our papers can be enjoyed by this highly mixed group. I consider myself a layman in the midst of scientists, so let me express some of my own concerns.

Most of you will be using what you *think* is the easiest form of public communication — the lecture. Actually, it is the fastest and easiest form to *use* but it is the most difficult way of transmitting a message. If the scientist needs public support for his research projects, he must be able to arouse the interest of people beyond the scientific community; he must help *them* understand.

The scientist often uses scientific names of plants and animals without giving their common names. I suggest writing out both –*Caladium colocasia* and Taro, and then using the word "taro" for the rest of the presentation.

One of the dangers any group can fall into is the use of "in-house" language. For example, I work for NPS, DI; our central office is WASO, and it establishes policies that are interpreted and come to PUHO through WRO and PAAR. The uninitiated would never know that NPS is National Park Service, DI is Department of the Interior, WASO is the Washington Office in D.C., PUHO is Pu'uhonua O Honaunau National Historical Park, WRO is Western Regional Office, and PAAR is Pacific Area Office.

Some years ago, I worked at Saratoga National Historic Park, a Revoluntionary War Battlefield in upstate New York. We sold a booklet about the battle there. One day I noticed some visitors laughing over the book. I found their merriment stemmed from another example of "in-house" talk. For those of you unfamilair with the Battle of Saratoga, the American army was commanded by Gen. Horatio Gates; the British army, by Gen. John Burgoyne. One passage in the booklet described the advance of Burgoyne's army toward the American position as follows:

"Burgoyne's right and left flanks lay in the woods, but his front was open."

We quickly revised that passage !

In good communications we must *simplify* without reducing the presentation to a childish one.

The scientist needs to be "bilingual" and have a good understanding of objectives, human relations, and the techniques of presentations, — both verbal and non—verbal.

By "bilingual" I mean that in addition to a mastery of scientific language, the scientist needs the language of the communicator. Use the active voice — "I went to the woods" instead of "I had gone to the woods"; "We decided" instead of "It had been decided by us". Concentrate on *short sentences*. Your listener will find it easier to follow your presentation if s/he doesn't have to follow you through a forest of semi-colons and commas before you get to your point.

Use words that touch *emotions* so your listeners become involved in what you're saying. It may be better to say "stink" than "oderiferous", or "killed" instead of "dispatched". Graphic words are better but stop short of the point of nausea.

One may say, "But there is no simple word for that flower or animal." My reaction to that is, "Use the word, but explain it. Write it on the board !"

A speaker should avoid profanity or delving into the gory as a shock treatment. This tends to turn off a good part of the audience and to arouse negative reactions.

In speaking leave out as many "I's" as possible . . . "I did this" and "I did that." The constant use of "I" is irritating. Remove the static so your listeners can hear the music.

In preparing a speech, decide your objective in giving it, then prepare an outline. For instance, my objective here is to try to help you think of your listeners as people who need a better understanding of what you're saying. They represent an opportunity for you to recruit a wider body of truly interested people — not just a chance for you to recite the great things you've accomplished in language they can't understand.

In a 10-minute paper you must clearly state your objective; you haven't time to ramble. Choice of words and thoughts becomes important. As the presentations are made at this conference you will notice that some of the 10-minute papers will seem short, others of the same length will seem long. The difference will lie in the way they're written and the way they're presented. Remember, there isn't a boring subject in the world, only a boring presentation.

To make a good speech it's also necessary to understand human relations . . . to be sensitive to the listeners' feelings. Try to relate what you're saying to your listeners' experience. When addressing a luncheon meeting of the local Lions Club, *don't* present the same paper you gave last night at the dinner meeting of the botanical society. Too many times this happens because we're not as interested in having the listeners understand what we're saying as we are in having our names in the newspaper as luncheon speakers.

If you're going to present a paper or give a talk you must be willing to pay the price of preparation. Decide on your objective and use an outline. The beginner should write his talk out, re-write until he's satisified, then practice out loud on lay persons and re-write again, based on their feedback.

Arrive early at the meeting place, set up your equipment and look at the layout. It's better to provide your own equipment, e.g., movie projector, slide projector or tape recorder, because you're more familiar with it than one the facility might provide. When you come up to the stand, be ready to speak. Don't play with your papers, your glasses, etc. In making your presentation, relax, be natural, and talk to the people in the last row. Eye contact is very important. Movements help, but not distracting movements, like playing with your glasses, shifting your weight from one leg to the other, playing with the coins in your pocket. If you use gestures be sure they look natural.

In communicating with the public, the burden is on you, the speaker. Keep in mind that the hardest parts of a day to give a speech are : bright and early in the morning, right after lunch, and right after a dinner. This, of course, is when most speeches are scheduled. You need to use all the tricks in the book to keep the audience's attention.

Communications is serious business. The price of success is preparation, practice, and keeping the interest of the listeners in mind. We need to ask ourselves, "For whom am I presenting this paper, for listeners or myself ?" Give your audience full credit — without the student, there is no need for a teacher.

Superintendents' Corner

Editor's Note: *Dave Beal,superintendent of Great Smoky Mountains NP, welcomed attendees to the 8th Annual Scientific Research meeting at the Park's Tremont Environmental Education Center in June. His remarks deserve the wider circulation this corner affords.*

I have some observations to make on the usefulness of science programs. Traditionally, research in the national parks has been done in search of knowledge for its own sake. National parks are excellent outdoor laboratories and attract researchers. Our response was opportunistic and involved finding common ground with scientists and sharing resulting information. Over the years this relationship was mutually rewarding; knowledge increased substantially and was incorporated in interpretive programs and resource management activities.

More recently, however, science has been strongly supported and resources allocated for the express purpose of developing knowledge to help resolve management problems related to planning and development, resource management, interpretive information and visitor use. For a time it appeared that some managers believed science to be the answer to all problems; dependence on such studies for planning efforts and program implementation led to long term efforts, which could, at least partially, be responsible for Secretary Watt's observation about "paralysis in analysis."

But research produces data and information, not necessarily solutions. We should not expect it to do much more. Recommendations may be made, but objections are frequently raised. Interest groups, individuals, and other levels of government have access to science information too, and occasionally retain their own "hired guns" to dispute us. When researchers or scientists with access to the same data base arrive at highly conflicting interpretations, it is wise to reflect on whether the differences are scientific or ideological.

In this new era of public involvement in government activities, we need the best science we can afford. But with or without research efforts you can depend on the following "Beal's generalization," submitted with full knowledge of Oliver Wendell Holmes caveat that "no generalization is worth a damn, including this one." It is:

Those who disagree with any significant management decision will attack it at any level possible. A "hierarchy of vulnerability" is being established.

Let me illustrate:

Situation	Attack
1. Attempts to manage intuitively or in compliance with law and policy	Accusations of authoritarian and arrogant conduct.
2. Corrective measures to remedy observed complications or effects	Insufficient data base to justify.
3. Managers have some knowledge, but seek funding for more work	Belittle efforts, stress "common knowledge," award "golden fleeces."
4. Extensive data but differing interpretations	Expand or prolong study.
5. Conclusive or absolute evidence	Political appeal - change law to make exception.

You can see it is a "no win" proposition!

Timing and procedure may be more important than scientific fact in getting acceptance of change in our society.

Increasingly, government is being subjected to a burden of proof that is impossible to properly discharge. There is not enough time, money, or expertise available to us. Additionally, most problems cannot be resolved to the satisfaction of *all* parties, and our democratic system of government supports this.

A politician can be nominated by a simple majority of his fellow party members; he can be elected by a bare majority of the voters. He and others similarly selected can pass a law with a majority vote of the legislative body. At that point the career bureaucrat takes over. He and his kind are expected to implement the new law and satisfy everyone, including those who opposed it from the beginning.

By this process we have armed the public and interest groups with an arsenal of political and legal weapons, all well intended, with which to delay, obstruct and often defeat necessary resource preservation efforts. These valuable, but frequently abused two-edged weapons include but are not limited to: Freedom of Information Act, Privacy Act, National Environmental Act, Historic Preservation Act, Endangered Species Act, Clean Air Act, and others.

Management oriented science seems to be moving in the direction of the legal system (perhaps forced to do so by the laws cited). The approach is best described as *adversary* as opposed to *referred* — and it is one in which technicalities and "winning" may be improperly substituted for the goal of a search for knowledge.

Let me offer my fervent hope that we do not let this happen! This conference is a time for constructive dialog and learning — we can all grow in our disciplines and better serve our employers as a result.

Atlantic Ridley Turtle Update

By Milford Fletcher

On August 16, 1982, Biologist Robert King of Padre Island NS completed the NPS phase of reintroduction of the Atlantic Ridley Sea turtle. A total of 2,017 eggs was received from Mexico on June 23. Of this number 1,563 turtles hatched (77.6%) which we felt was quite good considering the eggs sat in boxes for 5 days at the Mexican border owing to, shall we say, administrative mixup between the two countries.

Of this number, 1,524 were imprinted and transported to the National Marine Fisheries Laboratory at Galveston for the head-start program. Heavy surf caused the loss of 34 animals during the imprinting process. A great number of beach profiles and nest box temperatures were taken and these data will be of great value. Although the beach sand temperature has considerable effect on the sex of the turtles, it does not appear that metabolic temperature will be a significant factor.

Another interesting development is the work done by the National Marine Fisheries with grafting. It is extremely difficult to mark a turtle in such a way that the mark (or tag) is distinguishable after several years of immersion in sea water. In short, grafts are taken from the bottom of the animal (the plastron) and transferred to the animal 's back. Since records can be maintained on which scute (scale) the graft was taken from and with the bottom scales being cream colored and the back ones black, it is quite conceivable that we now have a method of permanently marking the animal without flipper-tagging or other external devices. If this method works, we will have a method to uniquely identify any turtle which is found either dead or nesting and was part of the reintroduction project. This would provide us with a wealth of data on their movements, time to reach adulthood, nesting frequency, and many other facets of their life cycle and habits.

We are still ignorant of the factors which "imprint" turtles to return to the nesting beaches and may not have any meaningful answers for several years. Meanwhile, some wags have suggested that the adult turtles will return to the Laboratory at Galveston at maturity and attempt to mate with the green plastic buckets in which they spent their first year. Maybe.

Fletcher is Chief, Division of Natural Resources Management, for the Southwest Region of NPS.

Solar Outhouse *at Voyageurs NP solves remote area toilet problem, courtesy of the sun.*

Voyageurs National Park Installs Composting Toilets

By Ron Erickson *Public Information Officer, Voyageurs NP*

When conventional methods of waste disposal failed at two heavily-used, remote sites in Voyageurs National Park, managers installed composting toilets. Although composting systems have been used for the past 30 years in Scandinavia, they are just beginning to be used in this country.

Voyageurs National Park's glacially carved landscape stretches along Minnesota's northern border. Four large and 23 smaller lakes cover one-third of the park's 219,000 acres. Motorboats and other watercraft transport visitors to fishing hotspots and other destinations during the May to November open-water season. One hundred developed campsites and approximately 65 private resorts accommodate park visitors.

Mukooda Lake is one of three trout lakes in the park. Its clear water surrounded by tall red and white pines draws people to the group campsite, located in the southeastern corner of the park. This campsite, which is designed to accommodate five separate groups, is also the site of the annual Voyageur Days, a celebration of canoe races and a walleye feed sponsored by the Crane Lake Community Club. As many as 700 people have attended this special event.

The popularity of the campsite and the Voyageur Day Celebration make it one of the most heavily used campsites in the park. Two pit toilets could not handle the use without offensive odors and frequent need for relocation. Thin soils made repositioning difficult. The lack of road access and electricity precluded vault toilets or more sophisticated disposal systems.

The Clivus Multrum composting toilet provided an environmentally sound, long-term solution. A building with separate rooms for men and women, a decomposing tank and a solar-powered ventilation fan make up the system. The pre-fab building was purchased on GSA contract and features walls of 1" thick plywood. A plastic laminate makes the inside easy to clean, and the panel presents an attractive appearance from the outside.

The composting tank sits underneath the building and is vented by a fan which operates on electricity provided by a bank of photovoltaic cells. This venting moves air through baffles in the pile to allow aerobic, odor-free decomposition to occur. The tank is exposed to the heat of the sun through a window on the back of the building. Little maintenance is needed — about one shovelful of useable manure is produced each year. The total cost of the system installed at the site was $15,000.

The toilet at the Mukooda campsite was installed in June 1982. It is the second installed in the park. The first was placed in 1981 at the Kettle Falls Hotel and portage area.

Rod Booth, maintenance foreman in charge of the project, feels both units are operating successfully at present. Funds are being sought for a third unit in 1983. In the long run, these composting toilets provide an environmentally sound and cost efficient system and an example to the public of alternatives in waste management and energy use.

Plant-Poaching Study at Smokies

Plant-poaching in the National Parks and the efforts of two NPS scientists to combat it in the Great Smoky Mountains NP are described in detail in the Fall 1982 issue of *Earthwatch* by Susan P. Bratton, research biologist with the NPS Cooperative Research Unit at University of Georgia's Institute of Ecology. In the "Field Notes" section, Bratton tells of a park naturalist showing visitors an exceptionally fine stand of blooming pink ladyslippers — more than 200 plants — and then returning to find later every plant gone.

According to Bratton, "poachers come in all varieties, from ignorant tourists who dig up a few wildflowers for their home gardens to big-time thieves who clean out hundreds of high-priced cacti in one night."

Bratton and Peter White, research botanist from the Uplands Field Research Laboratory (where Bratton was stationed prior to her Georgia assignment) organized volunteer Earthwatch members for a 10-week investigation (from early April to mid-June). They covered nearly 50 sampling routes and the orchid populations along these routes, then computerized the summaries. The study documented the fact that human activity is depleting the number of showy flowers that casual park visitors can see from moderately easy routes.

Bratton and White will use their results to justify better enforcement, but they believe that education of the public is the real key to reducing plant poaching.

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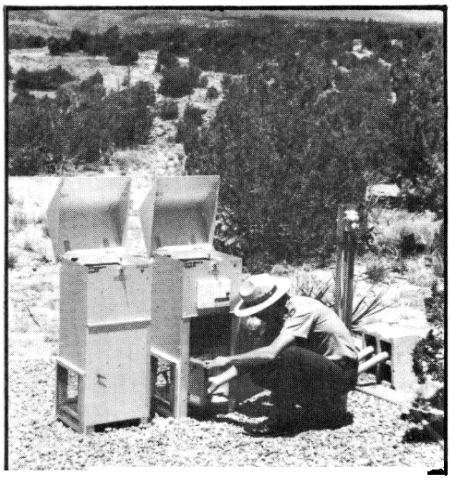

John Lissoway, Chief of Resources Management at Bandelier, adjusts particulate monitoring equipment that measures both coarse and fine particulates. (Fine particulates degrade visibility most because of their light-scattering action.) *(Story on page four).*

In the Next Issue:

"Protecting Mountain Meadows: A Grazing Management Plan," by David Parsons and Steven DeBenedetti; a 30-year retrospective on NPS natural resource management from William Briggle; "Elk Research at Mount Rainier: A Cooperative Effort," by Alan Ewert; an Agate Fossil Beds story on prehistoric bear-dogs, the first in a series by Ro Wauer on the NPS Resource Management Training Course, and more provocative letters to the editor.

Graber Reviews Giraffe's Neck

Francis Hitching's new book, *The Neck of the Giraffe* (Ticknor & Fields, $13.95), is reviewed for the Los Angeles Times by David Graber, NPS ecologist at Sequoia and Kings Canyon NPs. The review appeared in client papers throughout the country in September.

Graber describes Hitching's suggestion of "a mystical 'organizing principle of life,' using the similarity of organs in different creatures as evidence. That same evidence in living fossil creatures traditionally has been used to demonstrate how evolution uses the parts at hand to fashion new creatures, proceeding step by incremental step."

Some alternative views are considered in the Graber review.

"There are important and exciting new ideas in the wind," he writes. "it may well be that forces in addition to natural selection will be found to contribute significantly to evolution. Darwin's belief in the necessity of minute progressive changes has been rejected by many prominent evolutionists, who nonetheless call themselves 'Darwinians.' Steven Stanley ("The New Evolutionary Timetable") and Stephen Jay Gould ("The Panda's Thumb") offer well-written and learned fare for the non-biologist, both with better science than 'Giraffe.' "

Wild Mammal Management

A new book, *Problems in Management of Locally Abundant Wild Mammals*, (1981, P.A. Jewell and Sidney Holt, Academic Press) should be required reading for park biologists, resource specialists and park managers who deal with large mammals, according to word from Doug Houston, NPS research biologist. The book contains 419 pages, many of which deal with the management of herbivores in parks or reserves. Papers by G. Caughley, "Overpopulation," and A.R.E. Sinclair, "Environmental Carrying Capacity and the Evidence for Overabundance," are particularly thought-provoking. In addition, the book contains the proceedings of a workshop in which case histories of "overabundance" were reviewed. Workshop participants provide an 8-point outline for managers (on p. 352) on how to approach perceived "problems" in mammal management.

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